GENERAL LIBRARY

VOL. 44 JULY 1918 No. 185

1918
UNIV. OF MICH.
Engineering Library

United States Naval Institute Proceedings

The writers only are responsible for the contents of their respective articles

CONTENTS

	PAGE
The War's Benefits.—Foster	1447
The Wreck of the U. S. S. "Memphis."—Withers	1459
Letters on Naval Strategy (Cont.).—Frost	1465
Floating the Storage Battery on the Line.—Dunn	1495
The Type "V" Azimuth Circle.—Greenlee	1519
The Navy and Filibustering in the Fifties (Cont.).—Feipel	1527
Secretary's Notes	1547
Professional Notes	1551
International Notes: Naval War Notes	1645
International Notes: Diplomatic Notes	1714
Review of Books	1727
Information Index	1549

Copyright, 1918, by J. W. Conroy, Trustee for U. S. Naval Institute

Entered at the Post Office at Annapolis, Maryland, as Second Class Matter

BUY WAR SAVINGS STAMPS
FOR ALL THERE IS IN IT—
THIS IS OUR WAR—
WE MUST WIN IT!

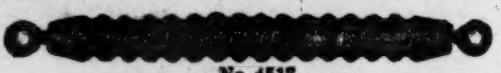
Louis Steinberger's Patents

INSULATION
"MADE IN AMERICA"

LIGHTNING-PROOF INSULATORS
1000 TO 1,000,000 VOLTS
INSULATORS ARE STANDARD WITH
UNITED STATES NAVY and ARMY
AND WIRELESS TELEGRAPH AND TELEPHONE COMPANIES

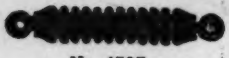
No. 7490

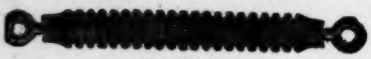
No. 7370


No. 4517

No. 4500

No. 4502


No. 4507

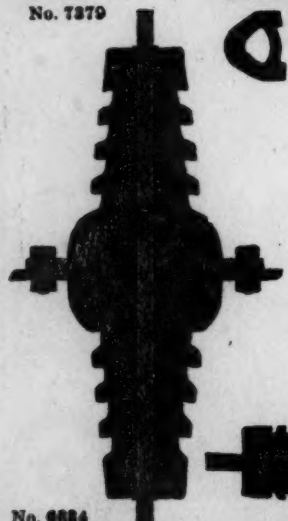

No. 4514

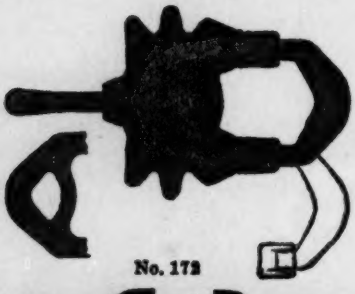
No. 7379

No. 159

No. 165

No. 7163


No. 6884


No. 172

No. 6854

Sole Manufacturers

ELECTRIC MFG. CO.

66-82 Washington St.
27-37 York St.

66-76 Front St.
1-23 Flint St.

BROOKLYN, N. Y., AMERICA

Vol. 44, No. 7 July 1918 Whole No. 185

United States Naval Institute

Proceedings

PUBLISHED MONTHLY
EDITED BY G. M. RAVENSCROFT

U. S. NAVAL INSTITUTE
ANNAPOLIS — MARYLAND

COPYRIGHT, 1918
By J. W. CONROY
TRUSTEE FOR U. S. NAVAL INSTITUTE

The Lord Baltimore Press
BALTIMORE, MD., U. S. A.

The writers only are responsible for the contents of their respective articles

CONTENTS

THE WAR'S BENEFITS. By Midshipman F. F. Foster, U. S. Navy.....1447
THE WRECK OF THE U. S. S. "MEMPHIS." By Lieutenant Commander T. Withers, Jr., U. S. Navy.....1459
LETTERS ON NAVAL STRATEGY. Based on the Naval Campaign of 1805. (Continued.) By Lieutenant Holloway H. Frost, U. S. Navy....1465
FLOATING THE STORAGE BATTERY ON THE LINE. By Lieutenant Lucius C. Dunn, U. S. Navy.....1495
THE TYPE "V" AZIMUTH CIRCLE. By Lieutenant H. R. Greenlee, U. S. Navy.....1519
THE NAVY AND FILIBUSTERING IN THE FIFTIES (Continued). By Louis N. Feipel 1527
SECRETARY'S NOTES 1547
PROFESSIONAL NOTES 1551
INTERNATIONAL NOTES: NAVAL WAR NOTES.....1645
INTERNATIONAL NOTES: DIPLOMATIC NOTES.....1714
REVIEW OF BOOKS 1727
INFORMATION INDEX 1549

340808

OFFICERS OF THE INSTITUTE

President

REAR ADMIRAL BRADLEY A. FISKE, U. S. NAVY

Vice-President

REAR ADMIRAL E. W. EBERLE, U. S. NAVY

Secretary and Treasurer

LIEUT. COMMANDER G. M. RAVENSCROFT, U. S. NAVY

Board of Control

CAPTAIN L. M. NULTON, U. S. NAVY
CAPTAIN G. W. LAWS, U. S. NAVY
COMMANDER ARTHUR ST. CLAIR SMITH, U. S. NAVY
COMMANDER JOHN DOWNES, U. S. NAVY
NAVAL CONSTRUCTOR J. A. FURER, U. S. NAVY
LIEUT. COMMANDER G. M. RAVENSCROFT, U. S. NAVY (*ex officio*)

PAST PRESIDENTS

OF THE

U. S. NAVAL INSTITUTE

ADMIRAL DAVID D. PORTER, U. S. NAVY, 1873

REAR ADMIRAL JOHN L. WORDEN, U. S. NAVY, 1874

REAR ADMIRAL C. R. P. RODGERS, U. S. NAVY, JAN. 1875–JAN. 1878

COMMODORE FOXHALL A. PARKER, U. S. NAVY, JAN. 1878–JAN. 1879

REAR ADMIRAL JOHN RODGERS, U. S. NAVY, JAN. 1879–JAN. 1882

REAR ADMIRAL C. R. P. RODGERS, U. S. NAVY, JAN. 1882–JAN. 1883

REAR ADMIRAL THORNTON A. JENKINS, U. S. NAVY, JAN. 1883–OCT. 1885

REAR ADMIRAL EDWARD SIMPSON, U. S. NAVY, OCT. 1885–OCT. 1887

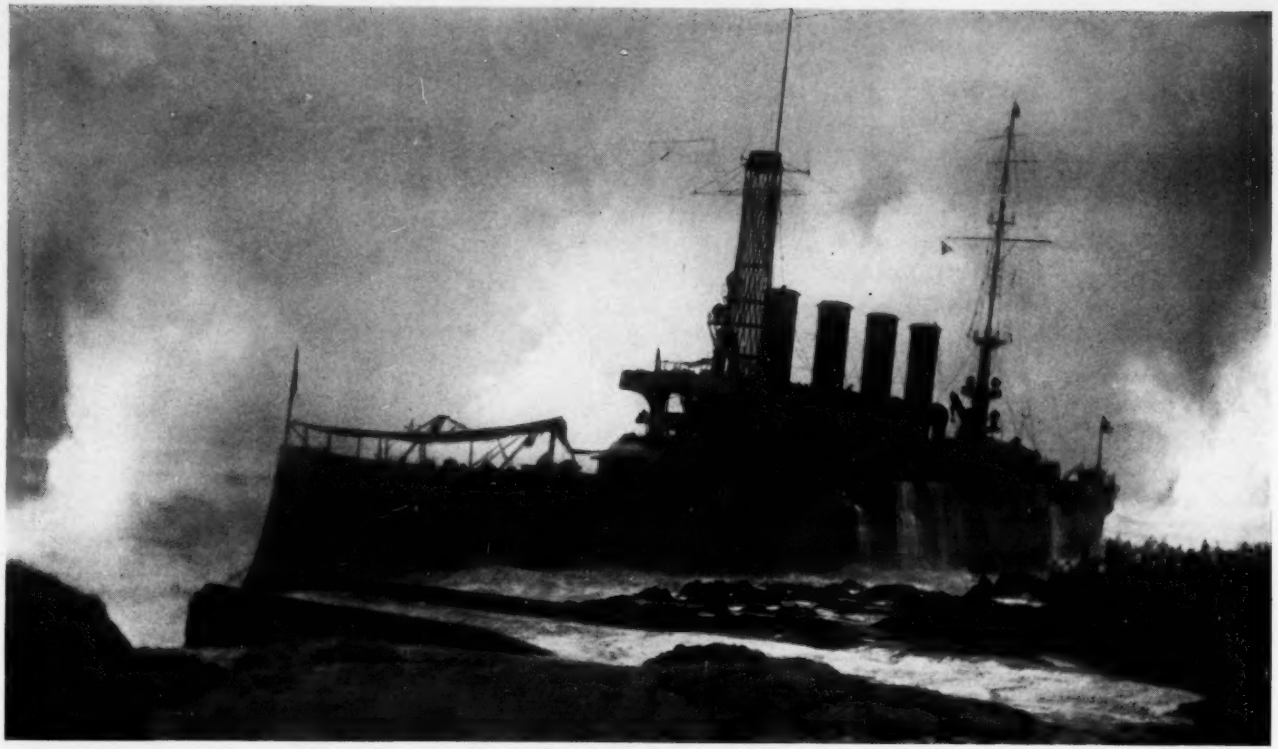
REAR ADMIRAL STEPHEN B. LUCE, U. S. NAVY, OCT. 1887–OCT. 1898

REAR ADMIRAL WM. T. SAMPSON, U. S. NAVY, OCT. 1898–OCT. 1902

REAR ADMIRAL H. C. TAYLOR, U. S. NAVY, OCT. 1902–OCT. 1904

REAR ADMIRAL C. F. GOODRICH, U. S. NAVY, OCT. 1904–OCT. 1909

REAR ADMIRAL RICHARD WAINWRIGHT, U. S. NAVY, OCT. 1909–OCT. 1911



THE WRECK OF THE U. S. S. MEMPHIS.
This photograph was taken about 30 minutes after the ship first grounded.

UNITED STATES
NAVAL INSTITUTE
PROCEEDINGS

Vol. 44, No. 7 JULY, 1918 Whole No. 185

[COPYRIGHTED]
U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE WAR'S BENEFITS

By MIDSHIPMAN F. F. FOSTER, U. S. Navy

"Will any good, commensurate with the woe brought on the peoples of the earth by Prussian militarism, come out of the present war?" This is a question that cannot be answered fully until history has written its verdict on the pages of time. Nevertheless, there are those, both in Europe and in the United States, who already see good results being wrought by the war, and who, piercing the veil of the future, predict far-reaching benefits. It is the purpose of this article to review briefly, from an American standpoint, their claims that good can come out of this particular evil.

First, from the point of view of the naval profession, the United States Navy will benefit: not only from the increase in matériel necessitated by our entrance into the fray, but also from a better understanding of the navy that the people of the country are getting. The personnel of the navy expanded from 69,046 on April 6, 1917, to 201,281 on April 1, 1918. It is not an unwarranted assumption that when all these men who have enlisted for the war return to their peaceful occupations their interest and that of their relatives and friends in naval matters will not abate. They themselves, having had some naval experience, will form a nucleus capable of appreciating the merits of the navy's claims for attention. The advantage of this is evident when we remember that, in times past, the navy's troubles have been due largely to the failure of the people to understand the importance of the navy as a factor in the national welfare.

This photograph was taken about 30 minutes after the ship first grounded.

Furthermore, the war has shown the high standard of efficiency maintained by the navy. When, in May, 1917, a flotilla of our destroyers arrived at an English port, and were asked how soon they would be able to go out on patrol, they answered—although they had just finished a cruise of 3000 miles and had found at its end a mine-field awaiting them—"We are ready now." That reply typified the entire navy's idea and state of preparedness.

Proof of the effectiveness of the American Navy's help is found in the frequent praise accorded our officers and ships by the British, and in the fact (although this may be only a coincidence) that about the time our destroyers began to hunt the U-boats the curve of submarine losses took a decided drop, and has never since reached the mark it attained in April, 1917. The official reputation gained by the navy at home is reflected in the report of the House sub-committee appointed to investigate the navy's activities in the war, which was submitted to Congress in March of this year. Not a single word of criticism occurred in the entire report, while on the other hand its general tenor was highly flattering. The following conclusions were reached and concurred in by the full committee:

First: All appropriations have been expended or obligated with judgment, caution and economy, considering that haste was necessary to bring results, and abnormal conditions prevailed.

Second: The navy, with limited personnel and matériel, was suddenly called to face many difficult and untried problems and has met the situation with rare skill, ingenuity and despatch and a high degree of success.

Third: The efficiency of the navy's pre-war organization, the readiness and fitness of its men and ships, were early put to the acid test and thus far in no way have they been found wanting. We feel that the last 12 months presents for the navy a remarkable record of achievement, of steadily increasing power in both personnel and matériel, of rapidly expanding resources and of well-matured plans for the future, whether the war be long or short.

To quote further from the report:

We have learned by personal observation, as well as by inquiry, something of the Atlantic fleet, and we feel we can say that the condition of ships and personnel, all things considered, is more than satisfactory. That this condition exists is due to Admiral Mayo, its commander-in-chief, and every officer and man under him.

When the war came Admiral Mayo is reported to have said: "I did not give a single solitary order of any kind or description to pass the fleet from a peace to a war basis."

The task of reconstruction and training has been difficult, but we learn that officers and men have devoted themselves to this task with patience,

endurance, pluck and skill of the highest order. So well have they succeeded that we feel justified to report, "Sirs, all is well with the fleet."

This high opinion of the navy is evidently shared by the nation's business men. Henry Ford in a recent interview said:

The navy is going to play the important part in this struggle before peace comes. And the one big reason is that the United States Navy is the most efficient organization I have ever seen in action. Its men are all alert, clever, working toward a common purpose, and willing to be on the job 24 hours a day whenever necessary, which is quite often. That is what I call efficiency. I always thought that we had one of the best organizations in the world, but I am willing and proud to take off my hat to the Navy Department.

But greater even than the navy's absolute efficiency is its relative effectiveness. The navy exemplifies to a much higher degree than the army the use of machinery in modern warfare, which makes the wars of to-day so deadly. Whereas in the navy, the 1000 men comprising the crew of a dreadnought fight with a $15,000,000 machine, an equal number of soldiers in the army fight with a war equipment valued at, roughly, only $100,000. At present, the combined British and American navies total about 700,000 men. Yet those 700,000, by putting the pressure of hunger on Germany through the blockade, have done more to make the German people feel the pinch of war than the millions in the trenches are doing.

Of additional benefit to the navy is the war's demonstration of the importance of sea power. The one obstacle to complete and rapid success of German arms has been the Grand Fleet of England. To-day the most important battle of the war is being waged upon the sea. Writers and orators may boast of the American air program, of her man power, and of her resources in men and money, but the cold fact remains, and is recognized by the allied leaders, that all these preparations and resources will be of no avail unless the submarine menace is met and downed. Defensive measures will not win: as long as Germany can sink a $1,000,000 ship carrying a $1,000,000 cargo with a $10,000 torpedo, the advantage lies with the enemy. To win, we must destroy German submarines faster than they are built: the success of the anti-submarine campaign is of pre-eminent importance. The conquest of the submarine, and in this way, the fate of the war, rests solely on the allied naval forces.

The war is thus gradually bringing home to the American people that the navy is the important factor in war; that our navy

is our first, our least expensive, and our most effective line of defense.

Of kindred interest to the advantage the navy will reap from the war is the advancement of the American merchant marine. Time was when our flag flew in every port; when the Yankee clipper ship ruled the waves. We lost our proud position in the forefront of maritime nations during the Civil War, and, up to 1914, had not regained it. This is shown by the following figures: In 1826, 92.5 per cent—in value—of the cargoes entering and clearing the ports of this country were carried in American bottoms; in 1913, our ships transported 10 per cent. But when the English Navy disposed of one of our closest rivals by wiping German commerce off the sea, our merchant marine began to pick up. There followed commercial penetration into new fields, principally South American; United States ships began to carry United States goods into territory that had been monopolized by Germany.

The American shipping trade received a new and greater impetus when this nation declared war, and we took upon ourselves the task of feeding the Allies. The necessity for outbuilding the submarines forced the government, with unlimited capital, into the game. As a result, building facilities were increased enormously. Whereas, in 1915, the output of United States shipyards was 225,122 gross tons, in 1918 it will be 3,000,000 or 4,000,000 tons. The Hog Island plant alone, when it is completed, will have a yearly building capacity in excess of that of all of our shipyards combined before the war. Chairman Hurley of the Shipping Board estimates that by 1919 we shall be turning out ships at the rate of 2,000,000 tons a month. Thus it is that the war has given our merchant marine a wonderful chance to come back. When peace arrives, American tonnage and American shipbuilding facilities will be many times what they were in 1913.

Our foreign commerce will also be benefited by the war; not only directly, from the advantage of new markets all over the world for American goods, and from the fact that Germany will have to build her trade from the ground up and under the further handicap of hostile public feeling, but also indirectly, from being carried on in American ships; no longer will merchandise destined for South America have to be sent first to Europe, there to await the pleasure of foreign shipping interests.

In view of the foregoing, it is hoped that, as a result of the war, peace will find the United States prepared to take the position

to which its geographical location and natural resources entitle it: the leading maritime and the greatest commercial nation in the world.

In the third place, the beneficial effects of the war are, even now, apparent in American industries. "Necessity is the mother of invention": given the necessity, the invention is bound to follow. Thus it has proved to be in the last four years throughout the industries of the United States.

For example, when our imports of dye stuff from Germany were cut off, the American dye industry, then undeveloped—in which state it had been kept by German competitive methods—was called upon to supply all of America's demands. It rose to the occasion, so that to-day over 90 manufacturing houses—instead of five or six, as in 1914—are producing dyes the equal of the German products. Similarly, various drugs, such as salvarsan and procaine, for our entire supply of which we depended upon Germany four years ago, are now being manufactured in the United States in sufficient quantity to fill domestic needs. The conclusion of peace will find our dye and drug industries well intrenched, and prepared to compete with the Germans in foreign markets.

Likewise, the automobile industry is bound to profit from the development of the aeroplane engine. The Liberty motor is a familiar example of what the war has made possible. Another instance was the designing of a standard army truck. The War Department, realizing what immense advantages would accrue from the adoption of such a truck, called a meeting of the foremost designers in the country and asked them to pool their knowledge, skill, and experience, and produce a standard truck, of superior qualities, for the use of our army. As a result of these men's response the truck industry took a leap in advance almost over night that would have required, had it not been for the demands of war, several years.

These two examples, the Liberty motor and the army truck, illustrate strikingly a lesson that American manufacturers are learning from the war: cooperation, not competition, makes for the highest degree of perfection in industrial science. Manufacturers, instead of fighting continuously to keep their trade secrets from each other, are, under the government's leadership, throwing their private patents into the jack-pot, in order that Uncle Sam can pick here and discard there and combine yonder and obtain the best product of which the nation is capable. Men and businesses that

heretofore have been bitter enemies, now find themselves working shoulder to shoulder for their country's good. It is a lesson that will stand us in good stead when we come to compete with German methods after the war, for it was upon this system that Germany built up her immense foreign commerce. Only by continued and wider application of the principle of cooperation can we hope to succeed in the coming international trade rivalry.

Industry in general will profit in still another way from the war. The strain upon the industrial resources, and the reduction in the labor supply, call for the highest attainable efficiency of production in all fields. Consequently, new methods and new machinery are being introduced, especially in the so-called essential industries, where federal aid has been extended liberally to assist manufacturers in installing new and better equipment.

Take the coke industry, for example. Before the war, more than three-fourths of the coke produced in this country was made in beehive ovens, which turned out coke all right, but which did not save the by-products of the coking process. Enough ammonium sulphate to supply fertilizer for the entire United States for two years was thus lost annually. The total loss of by-products amounted to about $80,000,000 every year. To-day, the dye industry's demands for coal tar, and the munition makers' demands for benzol and toluol, all by-products of coking, are bringing into more general employment a modern type of oven, one that conserves the precious by-products.

So it goes all down the line. The war has stimulated invention, has made possible, because necessary, the adoption of new equipment, and has placed many American industries on their feet and in a better position to compete with foreign trade after the war. The conclusion of peace will find the United States, industrially, decades in advance of where it stood in 1914.

Fourth of the war's good results to the United States will be a greater economic stability. In order to better realize what this means, let us take a look at history. Ferrero, the most eminent of modern Italian historians, has drawn an analogy between the Roman Empire in the century or so immediately preceding its fall and the United States of to-day. Rome's downfall, historians are agreed, was due not so much to the strength of the barbarian onslaught as to the weakened economic conditions prevailing within the empire itself. For even before reaching the zenith of

her power, Rome was able to beat off the invaders; and more, to carry the campaign well into the enemy's territory. It was only when certain economic and social evils had done their work within that Rome succumbed to attacks from without.

The chief of these evils, as Ferrero has shown, was urbanization, a concentration of the population in cities. This was accompanied by a control of wealth on the part of the few, and by a taste for luxury among the public in general, but especially among the very wealthy classes. The primary cause of urbanization was the people's love of ease and comfort. These could best be found in the cities, and so to the cities the people flocked. The city of that time was held to be the highest product of civilization; it was the center of everything—of art, of business, of learning. It contained everything that made for a life of luxury.

The cities of the empire grew and prospered, but it was at the expense of the rural districts. People of all classes left the country to live in the city; crop production fell off seriously; and there accumulated in the cities large masses of poor, consumers but not producers. The proprietors of the land took up permanent residences in the cities, and ceased to exercise that personal supervision over their estates which is so necessary to successful farming; thus absentee landlordism added its evils to the empire's burden. The conditions went from bad to worse; the agricultural regions continued to lose population until the empire itself tottered and gave way. The fall of Rome, let us remember, was thus due primarily to the people's love of luxury, and, more directly, to the resultant urbanization.

To-day, the same evils of luxury and urbanization have developed to serious proportions in the United States. Before the war came to test our mettle, the American people had an international reputation for luxury and its twin, extravagance. The following items in our national bill for luxuries show how nearly our character approached our reputation, and what a strong grip our luxurious habits had on us: In the year 1915, according to the *Scientific American*, "$1,900,000,000 was spent upon the sport of motoring in the United States." In 1909, the value of the intoxicating liquors produced and imported was $694,000,000, while tobacco products and imports in the same year had a value of $94,000,000. Precious stones to the value of $100,000,000 were imported through the port of New York alone, in 1916.

The American people's taste for luxury, of which the preceding figures are evidence, has led to the same evil of urbanization that brought ruin to ancient Rome. A love of ease has drawn the population into the cities: the lure of lights holds a stronger appeal than does the call of the soil; people would rather enjoy the amusements and theaters, the street cars and other public utilities of the city than undergo the rigors and endure the isolation of farm life; they prefer the 7.30 risings of the city dwellers to the 3.30 reveille of the farmer. The extent to which our population is concentrated in cities is seen when we remember that though the United States before the war had a population of only 31 per square mile as compared with 658 in Belgium and 374 in the United Kingdom, yet several of the largest cities of the world are in this country. The effect of this distribution of our population was already beginning to be felt prior to 1914 when the rise in the cost of living had come to be one of the gravest problems confronting the nation; the increased cost of living was due to a disturbance in the balance between production and consumption, which, in turn, was caused by urbanization.

Coming now to the war's probable effects on the evils of luxury and urbanization, it is safe to predict that they will be greatly ameliorated. For one thing, more is being made of the farmer. The slogan of the Hooverites, "Food will win the war," has given to the labor of farming a certain dignity. The agriculturist of to-day sees himself not as an humble tiller of the soil, but as a figure of national, even of international, importance, as the man behind the man behind the gun. At the same time, the "home garden" idea is making the people, as a whole, realize the importance of the farmer's position. Then, too, the number of mechanical inventions caused by the war and the shortage of labor are bringing machinery into more general use on the farm, and this tends to reduce the drudgery of that life. Consequently, peace may be expected to bring with it a redistribution of population. More people will take up farm life; and agricultural prosperity, the foundation upon which the nation's economic security is based, will be restored.

But the war is also effecting a cure on the root of the evil, love of luxury. Nations, not merely armies, are at war, and the price of victory is united effort and self-sacrifice on the part of every man, woman and child in the United States. So we find among the

people a wide-spread practice of economy, from the millionaire, who reduces his staff of servants, to the poor man, who gives up some of his movies. The following figures, taken from a compilation by the National City Bank of New York, are evidence of the extent to which the war has already affected our imports of luxuries: Cotton laces imported in 1917 were $14,000,000 less in value than in 1914. Feathers fell off from $6,000,000 in 1914 to $3,000,000 in 1917. Importations of silk laces in 1916 and silk plushes in 1914 dropped about 50 per cent in 1917; while silk ribbons last year had a value only 10 per cent of the 1914 imports. Malt liquors imported in 1914 amounted to 5,500,000 gallons, while in 1917 only 1,500,000 gallons were imported. Gin suffered a reduction from nearly 1,000,000 gallons in 1914 to 230,000 gallons in 1917. Chicle, the principal constituent of chewing gum, fell over 2,000,000 pounds from 1915 to 1917.

Thus the war is seen to be breaking up the American people's habits of luxurious living and extravagance. If the struggle continues until we are forced to fight for existence as England and France have had to fight, the evil will be almost entirely eradicated. At any rate, the war has checked the spread of wanton indulgence, and we are realizing that selfish waste and luxury are sins. It is to be hoped that having learned our lesson we shall not go back to the ante-bellum habits that were destroying our economic stability.

Fifth in the list of the war's salutary results comes its general moral effect. Consider the immensely broadening influence on the life of a man who leaves his peace-time habits—which have led him over the same paths of thought and action year after year—and dons khaki to fight with his countrymen for the rights of humanity. He cannot fail to grasp some of the bigness of war, and profit from his new environment; the glory of sacrifice, the majesty of achievement, are ever-present inspirations. Such an experience—the removal of a man from his ordinary humdrum existence into the maelstrom of international events; witnessing the operation and success of the huge machine in which he can feel himself a part; and above all, striving and sacrificing for the good of others—these things will leave their mark on the soldier of to-day. He will have gained from the war a greater breadth of vision, and a keener appreciation of himself and others.

As supplementary to this good result, the millions of men who compose our army will benefit from the discipline of army life. Being, for the most part, young men, they will the more readily be influenced and molded by their new surroundings. They will form habits of neatness, precision, and obedience; they will be trained to shoulder responsibilities and to act quickly in emergencies; they will learn to think of others; they will see the value of organization. These broadening and better influences of army life, exerted upon the millions from all walks of life in our draft army, will have a wide-spread effect throughout the country at large after the war.

Not alone upon the soldier, however, is the war having a moral influence. The people at home, the mothers, wives, fathers, brothers, and sisters of the fighters, are likewise making sacrifices. They, too, are learning to think of others; they are gaining a truer perspective of life in general, and are seeing what things really count in this world.

The subject of war's moral influence on a nation is too vast to permit of its being dealt with fully here. Let us remember, though, how it sobers a nation's thought, and brings millions face to face with bedrock realities. To quote from "The Student in Arms": "In the hour of danger all good men are believers; they choose the spiritual, and reject the material." And nations are only individuals in the aggregate. War destroys the shams and exposes the tinsel. Halted in their mad pursuit of pleasure the people of a country are forced to think seriously, to take stock of themselves, and discover breaches to rebuild the walls. Out of the horrors and tragedies of every great war is born a new people. Who dares deny that the moral tone of the United States will be higher to-morrow as a result of the trials of to-day?

Sixthly, anent the war's benefits to this country will be the fact that the United States has at last branched out into world politics. We have assumed a position of preeminent international importance; upon us is pinned allied faith in ultimate victory. We have become a World Power. No longer can we say: "Europe for Europeans; let us stay at home." We have undertaken to discharge an obligation to humanity; that duty fulfilled, we shall not be able to return to the *status quo ante*.

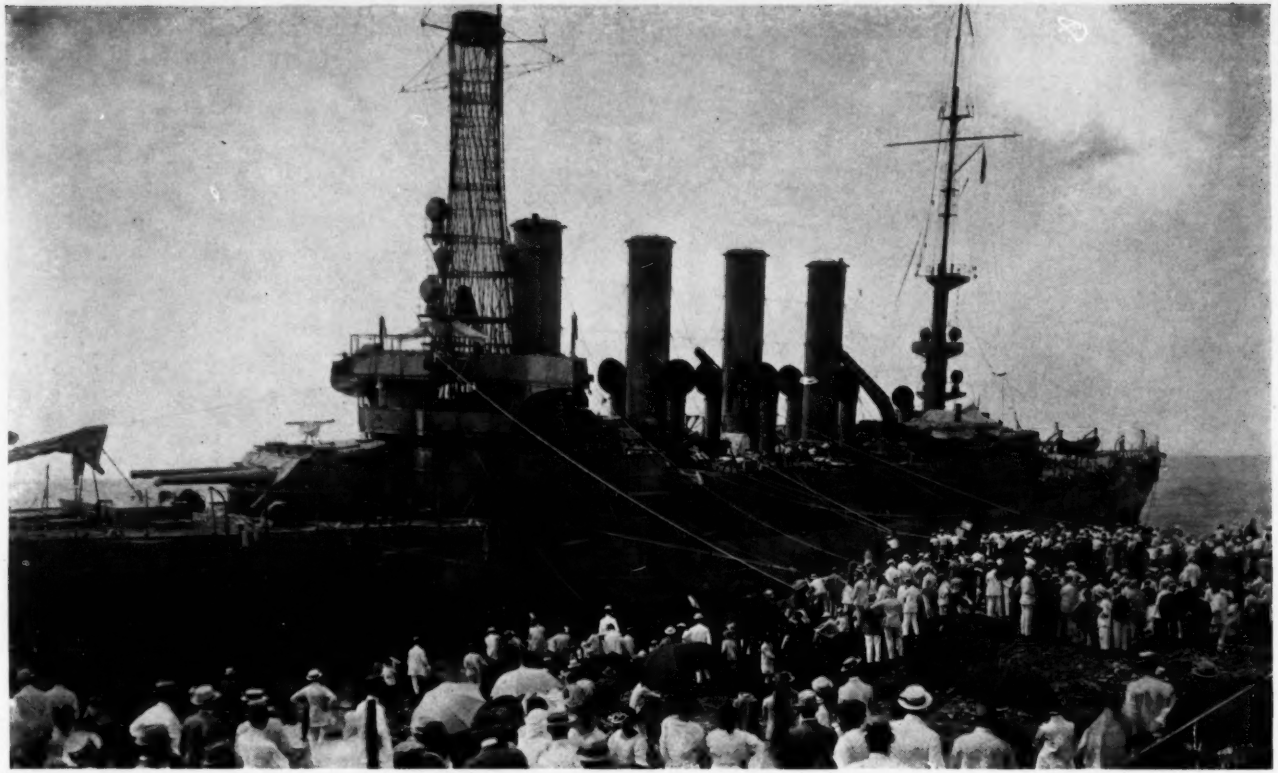
By taking up the sword in defense of civilization, the United States has gained prestige abroad; has broken through its shell of

isolation; also it has made friendships with other nations. The friends thus secured will stand us in good stead if ever, in the near future, we are attacked. Without friends, we should in such an emergency be nearly helpless; but the mere existence of friends will make an enemy think twice before attacking us. Hence this war is leading our country into a position of greater security for the future.

As a second of the war's international results will be a closer union of France, England, and the United States. The bond of sympathy now being forged in the mud of Northern France will do much to keep these nations at peace with each other for centuries. And, should German militarism be effectually crushed, this union of tried and true friends may form the beginning of international peace, that goal of the humanitarian, when "Wars and rumors of wars" shall cease, and "Peace on earth, good will to men" shall be the sign of the times.

To summarize the benefits the present war is expected to bring: A benefit to the Navy, through popular realization of its importance and effectiveness; a benefit to the merchant marine from government help, increased building facilities, and new fields; a benefit to industries, due to the necessity of attaining maxium efficiency of production, and the consequent stimulus of man's inventive genius, and to the demands created for certain American products; an economic benefit to the nation at large, resulting from a redistribution of population, and the practice of war economy; a moral benefit to the people due to war's sobering and uplifting influence; and lastly, a benefit to the United States internationally, through increased prestige, wider activity in world politics, and the securing of friends.

The foregoing are not intended as necessarily certain results of the present conflict; nor is it claimed that they cover the field completely. Rather they are advanced as some very probable benefits of the war. In view of them, although we cannot but deplore the enormous suffering brought on the world, we can at least admit the evidence of the hand of Providence guiding man's footsteps. And although we sometimes wonder that man is allowed to stumble, we yet are justified in trusting and believing that all will turn out well in the end—that even the dark cloud of war will show a silver lining.



U. S. S. "MEMPHIS" THE DAY AFTER THE WRECK.

A comparison with the other photograph (facing p. 1447) will give the reader some idea of the height of the sea. Note the lines used for the rescue of the crew.

A comparison with the other photograph (facing p. 1447) will give the reader some idea of the height of the sea. Note the lines used for the rescue of the crew.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE WRECK OF THE U. S. S. *MEMPHIS*

By LIEUTENANT COMMANDER T. WITHERS, JR., U. S. Navy

On August 29, 1916, the U. S. S. *Memphis* was wrecked on the beach at Santo Domingo City, Santo Domingo, by enormous seas which were *unaccompanied by any wind whatsoever.* This statement is made emphatic because, both officially and unofficially, there is frequently seen the statement that the *Memphis* was wrecked by a hurricane.

The *Memphis* was the flagship of the commander of the cruiser force, Atlantic fleet, and, at the time of her loss, had been lying at anchor off Santo Domingo City most of the summer.

A great deal of boating was necessary, and it had been found advantageous to anchor as far to the eastward as practicable in order to get what lee we could from the point on the Duarte side of the Ozama River. The ship was anchored in 8½ fathoms of water, with the lighthouse bearing about 300° true. The prevailing wind and sea were from the southeast, and the anchorage was almost always rough.

The anchorage at Santo Domingo City is very restricted, and there is no protection from east to west through south. The westerly current caused the ship to ride, heading east. The anchorage is on a narrow shelf or ledge. This ledge is so narrow that the 10-fathom curve is but a few yards inside of the 100-fathom curve.

The danger of such an anchorage had been fully realized and everything was habitually kept in readiness to get under way upon short notice. Forty-five minutes was the time within which the ship could get under way with plenty of power available.

About one week before the loss of the ship a heavy blow came from the south. The ship was ready to get under way in less than 45 minutes. However, the anchor held well and though the wind became very strong it was decided not to get under way at this time.

On the afternoon of August 29, 1916, at 1 o'clock, the usual recreation party was sent ashore and all regular boats ran as usual, up to and including the 3.30 boat. The sea was rough, but no more so than usual.

At 3.45 p. m. orders were given to get ready to get under way. This was done because the commanding officer thought that the swell was increasing. (The writer was below at this time and did not notice any increase in the motion of the ship.) As stated above, plans for getting under way quickly were complete. An emergency steaming watch was already detailed, boilers were primed, etc.

(With the permission of the readers the writer will use the big "I" for a few paragraphs, as he feels that he cannot otherwise describe how suddenly the calamity now arrived.)

At 3.50 p. m. I was in my room and heard the word passed to secure for sea and to get ready to get under way. I was on the sick list at the time and so did not receive the word directly as the other officers did.

At exactly 4 p. m. I stopped at the barometer outside the captain's cabin and read it. It read 30.00, which was not below normal. I had no difficulty in reading this mercurial barometer, so the reader can understand that there was very little motion on the ship.

Being curious in regard to our reason for getting under way, I went on the quarter-deck. Nobody had any idea of trouble ahead at this time.

A moment later I noticed ahead, to the eastward, an immense wave or swell approaching. This swell came at a small angle with the shore line and the inshore end of the swell curled some distance inland. As this swell got close to the ship its face became very steep, but the ship rode over it without swinging up to it.

At 3.45 p. m. a motor sailer had been sent in for the recreation party ashore, and this boat with 38 men in it was about 500 yards from the ship when this first swell passed the ship. At 4.05 p. m. this boat was thrown end over end by the *second* swell. The boat sank and all but about six of the men in her were drowned or smashed to death on the beach.

It is impossible for me to describe the astounding abruptness of the emergency. Immediately after the capsizing of our boat the U. S. S. *Castine* got under way and attempted to get to sea by

rounding the bow of the *Memphis.* The seas were too enormous and she was thrown toward the beach, bows on and with her rudder jammed hard left. She backed, and the current gradually drifted her into the lee of the *Memphis,* where she gathered sternway. At no time was the *Castine* more than 1000 yards from the *Memphis,* and yet from the bridge of the *Memphis,* 45 feet above the water, the *Castine* disappeared time and time again. Even her mastheads disappeared! To see the *Castine* fighting for her life was a terrifying sight.

However, the *Castine* was able to back up close to the *Memphis,* which was now acting as a breakwater, turn and get to sea under our stern, taking the waves a few points abaft her port beam.

On board the *Memphis* much was happening. Wave followed wave at intervals of perhaps 30 to 40 seconds. These waves were so large and their faces became so steep that they simply flowed over the ship. They flowed over our bridge many feet deep. They flowed over our stacks and flooded our fires!

These waves were driven by no wind. They took the shape of breakers as they approached the shallow water, but they had very little driving force. Approaching, they appeared irresistible, but, if one held his breath, it required but little strength to hold on to the ship. Things around the decks were torn loose by the motion of the ship, especially after she began landing hard, but the waves seemed to have very little smashing power and did but little direct damage.

At about 4.15 p. m. I reported to the captain that the ship was hitting bottom, but was not dragging. I am certain that she was striking bottom before she dragged, because I was taking bearings and I could plainly see that she struck in the trough of every wave.

Several attempts were made to let go our other anchor, but this could not be done.

At 4.20 p. m. the ship began to drag. Each wave would slide her a couple of hundred feet toward the beach and our anchor with 70 fathoms of chain would not even make her swing up to the sea, which was about broad on our starboard bow. The steep front of each wave acted as an inclined plane and forced the ship inshore.

The water shipped down the stacks so deadened our fires that all hope of saving the ship quickly vanished. Within five minutes after the ship began to drag she was thrown on the bottom so hard

that most of the crew were knocked down, mess tables were torn from their brackets, the ready shells for the broadside guns burst from their racks, piping, etc., crashed down, and below decks became a death trap.

On one mighty heave the ship landed well over on her port bilge and many expected to have her turn nearly over on the next wave. However, she straightened up and came in pretty nearly on an even keel.

By this time the ship, originally drawing about 29 feet of water, was in shallow water and the motion became most violent. Practically everybody had to be taken care of on the upper deck.

This would have been an impossibility had anything but the most perfect order and discipline prevailed. The men were superb, and their spirit was fine to see and feel.

Life-lines were quickly rigged and the men were divided into groups by their officers and petty officers. These groups huddled in the lee of the stacks, of the bridge, etc.

Much had happened below. The dynamos stopped, but the engineers stuck to their posts. Two boilers were crushed by a coral pinnacle pushing them up against the deck above. The men in this fire-room were scalded horribly, as were the chief engineer, Lieutenant C. A. Jones, and Machinist Wiley. However, all of them stuck until they were ordered up, and even then Lieutenant Jones refused to go because he thought that he heard the engines turning. What he heard was the engines breaking up under the pounding they were getting from the bottom of the ship. On deck it was difficult to keep the engineer's force from going below in a body when they heard that Lieutenant Jones was hurt and couldn't be gotten out. And nothing could be more inspiring than Lieutenant Jones' request, when he arrived upon the bridge, to "Get my hurt men ashore if you can. Don't bother about me"; while his "hurt men" refused to go ashore until their chief went.

By 4.50 p. m. the ship was in her present position, probably 75 yards from the cliffs along the beach.

Various attempts were made to get a line ashore, but the *offshore* breeze made this difficult. Finally a quartermaster heaved a lead, on a light line, ashore from the port wing of the bridge. Lines and hawsers were sent ashore and held by our marines and many of the citizens of the city, who did all that they could to help us. These hawsers had to be manned on shore because the motion of the ship would have parted them had they been belayed.

Snatch blocks with hauling lines were used as runners on the hawsers, and boatswain's chairs and bowlines served as breeches buoys. Once started, the rescue of the crew was nearly perfect. Great vigilance was necessary to *make* the most tired men go first, as it was quite a strain to keep holding on to the ship under the weight of the water that continued to come over.

In less than 3½ hours 750 men were sent ashore over the lines with but one minor accident, due to the parting of a hauling line.

Too much praise cannot be given to Chief Quartermaster Rose, who did so much to steady the men wherever he went, and who took men to the forehold, where they ducked for gear in the inky blackness.

As the crowds of men on the deck thinned, lines were abandoned until but one line was left. The last 24 to leave the ship (22 officers and two chief petty officers) left on this line in couples. The next to the last couple took ashore with them the end of an easing-out line led through a block on the ship. Thus the captain, Edward L. Beach, was eased ashore in safety. The rescue was complete.

When the lines were first rigged not a man would go ashore until the injured men had gone. This was carried to the extent of sending some dead men ashore.

Three times during the wreck the crew cheered. Once, when the *Castine* got to sea; again, when the first line reached the shore; and again, when Captain Beach landed safely.

To return to the waves—such waves! Several men from the motor sailer, mentioned before, were thrown alive into Fort Ozama, which is situated upon a cut-under cliff more than 40 feet high!

Most of the men killed were lost from the boats in the water. Some men, a very few, were washed overboard and lost within the first 20 minutes of the enormous seas. The others were killed doing their duty below and sticking to their posts under the most trying conditions.

In conclusion, I beg to state that never have I been more proud of being an officer in our navy than I was during the wreck of the *Memphis,* when every man stuck to his duty, helped his shipmates and proved himself worthy of the best traditions of the service. I know that every member of the crew will join me in wishing to serve again with the captain who was so wonderful throughout the wreck.

VICE ADMIRAL VILLENEUVE.

CORNWALLIS.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

LETTERS ON NAVAL STRATEGY

BASED ON THE NAVAL CAMPAIGN OF 1805

(CONTINUED)

By LIEUTENANT HOLLOWAY H. FROST, U. S. Navy

THIRD LETTER

1. NAPOLEON'S PLAN FOR THE MAJOR OPERATION

In the last letter we examined the execution of Napoleon's plan for a combined raid in the West Indies. In this letter we will examine together Napoleon's vast plan to mass in the Channel an overwhelming naval force to secure the safe passage of the flotilla.

As soon as the Emperor heard of Villeneuve's failure he sent a frigate to the West Indies to give Missiessy warning that he must shift for himself and directing him to land his troops in San Domingo and to return to France. There is one interesting point about this order to Missiessy. Before you give orders to any one division of your forces, it is necessary that you should have decided upon your general plan and upon the orders for the other divisions of your forces. This is necessary in order to insure the coordination of the various divisions. Now in this case, it appears that Napoleon gave out the orders to Missiessy before he had decided upon a general plan and upon the movements of the other divisions. When later he selected a general plan of action, he found it difficult and in fact impossible, to bring Missiessy into the combination, because, before he had decided upon this plan, he had ordered him to leave the very place at which he wished him to be. This will be brought home to us very clearly when we see how the plan was executed.

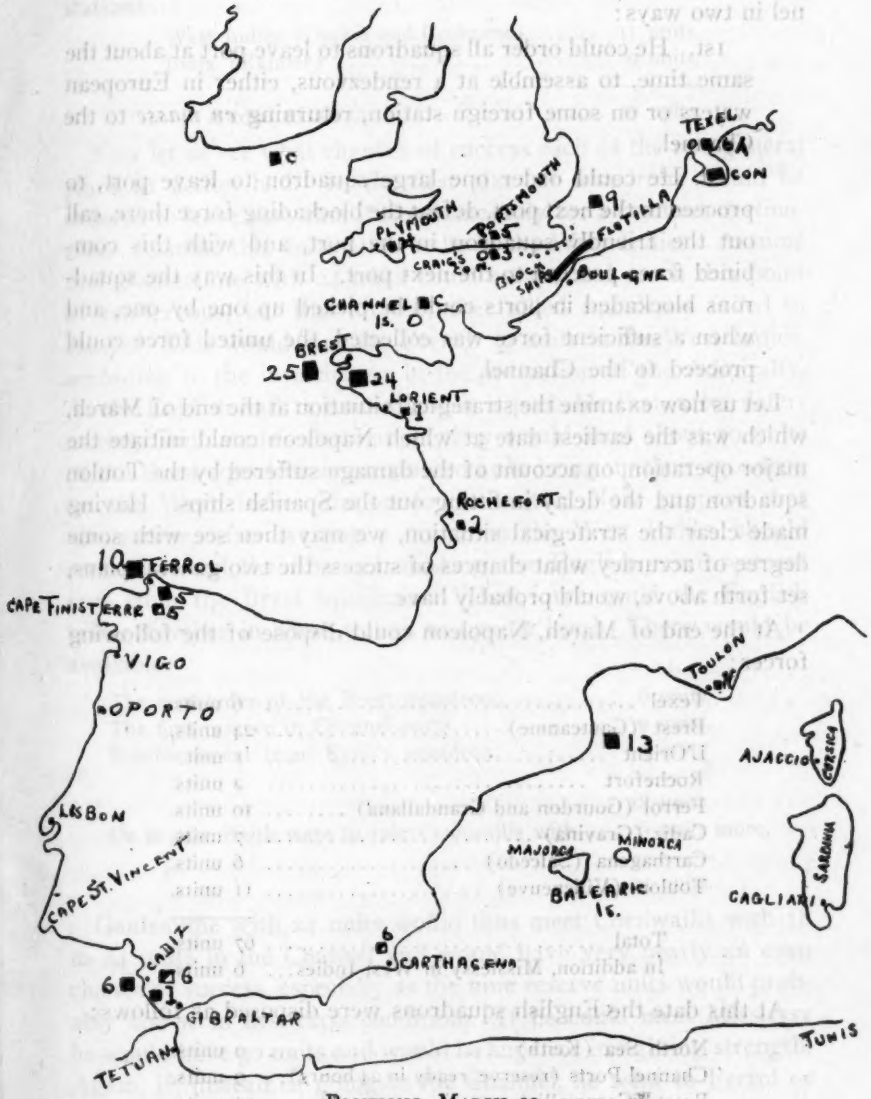
Napoleon now seems to have considered for some time a movement in force to India, but it is impossible for us to determine whether this scheme was one of the many plans given out from time to time merely to deceive the enemy or whether he seriously intended its execution. At any rate this plan was soon given over and he determined upon initiating the major operation at once.

You ask me whether Napoleon ever really intended to carry out an invasion of England. This is a question which has been much debated and which nobody can answer with certainty. It was known to all at the time that England and Russia were negotiating a treaty which provided for their joint action against Napoleon in Italy. As Napoleon was himself scheming to bring Italy under his influence and was soon to accept the Iron Crown, it is possible that the invasion project was merely a bluff to draw the English naval forces away from Italy. This is what a noted English author would have us believe.

There is another line of reasoning which you may possibly advance. You say that he may have thought himself compelled to attack for moral reasons, because after all his preparations and the vast sums of money he had spent upon the flotilla and the fleet, he could not afford to give over the undertaking without at least making the attempt. In the attempt it would of course be necessary for the fleet to gain the command of the Channel. If the fleet succeeded, all was well and the flotilla had a good chance to get across. If the fleet failed, then the admirals could be made the scapegoats and Napoleon's reputation would not be injured. As evidence of this you may quote from Napoleon's statement after the failure, in which he very unjustly heaped the blame upon poor Villeneuve; but this scheme appears to have been an afterthought, because at first he frankly took the blame for the failure.

On the other hand, we know that Napoleon stated repeatedly that France must gain a decision over England or fall, and that he considered the invasion of England "the greatest of all ends, which will cause all the rest to fall." He must have seen that now, when he had the Spanish and Dutch navies to assist him, and when all the continental nations were at peace with him, was the time, if ever, to strike.

However, as I have said already, there is no way to determine with certainty what was in Napoleon's mind. One guess is as good as another. Moreover, while of course it would be interesting to know his actual plan of operations, this concerned mostly national policy and national strategy, and did not, as it happened, concern the naval strategy, because, whether or not he actually intended the invasion, he undoubtedly did attempt with all his might to concentrate a superior naval force in the Channel in just the way he would have done if he had really intended the invasion.



POSITIONS, MARCH 30.

Jamaica	4
Leeward Islands	C
India	1–9
En Route San Domingo to Rochefort	6
En Route Madeira to Barbadoes	7

In general, Napoleon could effect this concentration in the Channel in two ways:

1st. He could order all squadrons to leave port at about the same time, to assemble at a rendezvous, either in European waters or on some foreign station, returning *en masse* to the Channel.

2d. He could order one large squadron to leave port, to proceed to the next port, defeat the blockading force there, call out the friendly squadron in the port, and with this combined force proceed to the next port. In this way the squadrons blockaded in ports could be picked up one by one, and when a sufficient force was collected, the united force could proceed to the Channel.

Let us now examine the strategical situation at the end of March, which was the earliest date at which Napoleon could initiate the major operation, on account of the damage suffered by the Toulon squadron and the delay in fitting out the Spanish ships. Having made clear the strategical situation, we may then see with some degree of accuracy what chances of success the two general plans, set forth above, would probably have.

At the end of March, Napoleon could dispose of the following forces:

Texel	6 units.
Brest (Ganteaume)	24 units.
L'Orient	1 unit.
Rochefort	2 units.
Ferrol (Gourdon and Grandallana)	10 units.
Cadiz (Gravina)	7 units.
Carthagena (Salcedo)	6 units.
Toulon (Villeneuve)	11 units.
Total	67 units.
In addition, Missiessy in West Indies	6 units.

At this date the English squadrons were disposed as follows:

North Sea (Keith)	9 units.
Channel Ports (reserve, ready in 24 hours)	9 units.
Brest (Cornwallis)	25 units.
Ferrol (Calder)	10 units.
Cadiz (Orde)	6 units.
Toulon (Nelson)	13 units.
Total	72 units.

In addition, the English had the following forces on foreign stations:

West Indies (Dacres and Cochrane)	11 units.
India (Rainier)	9 units.
A total of about	20 units.

Now let us see what chances of success each of the two general plans of action had. In the first plan all squadrons would be ordered to leave port almost simultaneously for a common destination. Assume this destination to be in the West Indies. Assume that Ganteaume with 24 units could escape and reach this point of rendezvous, but that all the other allied squadrons failed to escape. This would give the French 30 units in the West Indies, according to the information in the possession of the Admiralty. As the English had 11 units there, it is probable that, after determining Ganteaume's destination, they would send about 19 units of the Brest squadron in pursuit, so as to bring up their squadron on the West Indies station to 30 units. Now suppose that Ganteaume, after waiting a month in the West Indies, should return toward the Channel, missing the English reinforcement sent from the Brest squadron. What force could the English bring together in home waters to oppose him? There would be available:

The remainder of the Brest squadron	6 units.
The first reserve in Channel ports	9 units.
Reinforcement from Keith's squadron	3 units.
	18 units.
Or in case Keith were to join Cornwallis with	6 units more.
	24 units.

Ganteaume with 24 units would thus meet Cornwallis with 18 to 24 units in the Channel and would have very nearly an even chance of success, especially as the nine reserve units would probably not be in first-class condition. If he could meet Missiessy he would have 30 units and would be superior in fighting strength. Again, if, instead of going to the Channel, he went to Ferrol or Cadiz, he would be able to fall upon the blockading forces there, badly defeat them, and rally the friendly forces there, thus greatly increasing his strength for a move into the Channel. Thus, if Ganteaume could reach the West Indies, he could, even if all the

other squadrons failed to escape, accomplish great results. If the English failed to follow him, then he could ruin the English commerce and reduce their colonies in the West Indies. If they did follow him, then by a return to the Channel he had a very favorable opportunity to assure the safe crossing of the flotilla.

If Ganteaume failed to escape, then all the other allied squadrons together could accomplish little. Assume that they all escaped, with the exception of the Brest and Texel squadrons. This would give them a united force of 37 units in the West Indies, or if Missiessy could be rallied, 43. If the English squadrons followed up each escaping force, there would be 40 units massed in the West Indies to oppose them and there would still be in the Channel to meet a return 43 units, composed of Keith's and Cornwallis' squadrons and the reserve. As this English mass would be interposed between the allied mass and Ganteaume, it would fall upon the former and with a superiority in fighting strength of 4 to 3, decisively defeat it before Ganteaume could arrive. Thus, even assuming that a great mass of 43 allied units could be collected in the West Indies, it would have few chances of success as long as Ganteaume was held fast in Brest. Thus we see that the success of the first plan depended practically altogether upon Ganteaume's escape. If he escaped, there was a great chance of success; if he failed to escape, there was practically no chance of success.

Now we will consider the second plan, *i. e.*, for one large squadron to sail, picking up a sufficient number of other squadrons to give a move to the Channel reasonable chances of success. In this plan Ganteaume's squadron would naturally play the leading rôle. If Ganteaume could escape from Brest, drive off or defeat the Ferrol blockading force, pick up the 10 units in port, drive Orde off from Cadiz and join Gravina with his seven units, he would have 41 units in a wonderful strategic position. He could then proceed against Nelson in the Mediterranean, who would not have more than 29 units, even admitting that both Calder and Orde could join him without suffering any losses. Or he could hold his position, prepared to go to the Channel if Cornwallis were to go south after him. He could command the English trade routes to the Mediterranean and India. Furthermore, he could go to the West Indies, where the English would hardly dare to follow him, and do practically as he pleased. If they did follow him, a quick return to the Channel would assure the safe passage

of the flotilla. Thus, if Ganteaume could escape, there were very reasonable chances of success.

Now let us give Villeneuve the leading rôle. If he could escape Nelson, call out the six Spanish units at Carthagena, fall upon Orde at Cadiz, and rally Gravina, he would have 24 units. Then he might proceed to Ferrol, beat Calder and raise his force to 34 units. If he could concentrate there Missiessy with six units, and the three units from L'Orient and Rochefort, he would have 43 units. Even allowing this very improbable concentration at Ferrol, Cornwallis would have in the Channel, by calling in Keith, Orde and Calder, 50 units; by calling out the reserve, 59 units. As these would be interposed between Villeneuve with 43 and Ganteaume with 24, the French would have little chance of success. If Villeneuve were to enter the Channel Cornwallis would beat him with his far superior numbers before Ganteaume could come to his assistance. If Villeneuve were to wait at Ferrol, holding the English commerce routes, Cornwallis could wait until Nelson arrived, thus giving him a total of 72, which would very probably be increased by a number of ships of the second reserve. Then he could reestablish the blockade with six units off the Texel, 24 off Brest, and 42 could be sent against Villeneuve at Ferrol. If Villeneuve should go to the West Indies, 30 units would follow him, making the comparative forces in the West Indies 43 to 41. Cornwallis would have 36 off Brest, or 42 by calling in Keith, with which he could beat Villeneuve on his return. Thus, even if Villeneuve carried out the campaign with the greatest skill and resolution and had all the luck possible, he would have the chances of success against him.

From our discussion of these two plans of operation, we see that, as the opposing forces in Europe were practically equal in numbers, it was necessary for Napoleon, if he were to have reasonable chances of success, to concentrate in a distant area a force greater than he had at the time of this concentration on the line Ferrol-Brest-Texel. As long as the English could be superior everywhere in fighting power and could maintain more than half of their total force along this line, they were in a position to block all Napoleon's plans, no matter whether they were for the invasion of England or directed against the English commerce and colonies, because they could use their squadrons on this line to hold in port the French squadrons at Ferrol, Brest and Texel, and at the same

time to hold the Channel against other hostile squadrons. Therefore, no matter which of the two plans were used, its success depended almost altogether upon the escape of Ganteaume's squadron. If it escaped, the chances of success were good; if it were held in Brest, then the chances were extremely small. If the Brest squadron could not escape, then it would be necessary for Napoleon to concentrate all his other squadrons to have any chance of success at all.

I am afraid you will say that all this is mere theory, mere strategy on paper. I agree with you, but I wished to consider the the situation in this way first. It is very true that the French had far better chances on paper than they had on the sea. In the first place, it is always very important in strategic operations for the commanders to have accurate information of the enemy and of their own forces. In this matter the French had one advantage, that of the initiative. As the English were forced to follow the lead of the French, it was therefore especially essential for them to gain information of the movements of the French squadrons. On the other hand, as the French plan required that they break the blockade without fighting, and after this demanded evasion for the great part of the time rather than fighting, it was desirable for the French also to have accurate information of the movements of the English squadrons. Now, in the matter of gaining this information, the English had every advantage. Their frigates and small cruisers covered the seas and passed on to all commanders the latest news of their own and the enemy forces. On the other hand, the French commanders could get no news of the enemy or of their own forces, except what they could collect when they entered friendly ports. Apart from the matter of information, the French plans must necessarily have a bad effect upon the moral power of the admirals, because they all required that the English squadrons be avoided until the Channel could be reached. Thus, it was perfectly natural that the French admirals should be so busy evading the hostile squadrons as to interfere with the proper execution of the plan. An admiral who is expecting a superior enemy to come upon him at any instant will naturally believe every sail sighted to be this superior enemy, and when he is in this state of mind it is not probable that he will carry out his plan with resolution and determination. Also, this system of evasion would surely reduce the fighting spirit of the officers and crews, so that

when the time for fighting came, their resolution could not be that of the personnel of a squadron which was continually trying to force a battle upon the enemy. When we come to the execution of Napoleon's plan we will notice numerous examples of all these disadvantages with which the French admirals had to contend.

Now, having examined the strategical situation, having made a theoretical examination of the chances of success Napoleon had, and having seen how these chances were modified by practical considerations, we will describe the plan ordered by Napoleon. The orders for this plan, a combination of the two we have discussed above, were issued on March 2:

CAMPAIGN ORDER NO. 2. MARCH 2

1. Assumption as to enemy intentions—None.
2. General plan—To assemble an overwhelming naval force in the English Channel so as to insure the safe passage of the flotilla.
3. (a) Ganteaume to sail from Brest with his entire squadron of 24 units, carrying 3600 troops, at the end of March. To proceed with this force to Ferrol, beat or drive off the blockading squadron there and rally the 10 units in port. To proceed with this united force of 34 units to the West Indies. To rally Missiessy there, giving him a total of 40 units.

   (b) Villeneuve to sail from Toulon at the same time with his squadron of 11 units, having on board 3000 troops. To proceed to Cadiz, beat the English force there and call out Gravina with seven units. To proceed to the West Indies with these 18 units and report to Ganteaume for orders.

   (c) Ganteaume to take command of the entire force of 58 units. To sail for Boulogne by an unusual route so as to arrive there between June 10 and July 10. The Emperor was to be ready to cross with the flotilla as soon as Ganteaume appeared.

   (d) In case Ganteaume arrived in the West Indies and Villeneuve failed to appear, Ganteaume was to wait for him 30 days. At the expiration of this time limit, if he had over 25 ships of the line, he was to carry out the original plan of going to Boulogne. If he had less than this number, he was to go to Ferrol, where a reinforcement would be ready for him. However, if he thought a move to Boulogne with this smaller number desirable, he was authorized to make it.

   (e) In case Villeneuve arrived in the West Indies and Ganteaume failed to appear, Villeneuve was to wait for him for a period of 40 days. If Ganteaume failed to appear by this time, he was then to proceed to the Canaries and wait another 20 days. After this time limit had expired, he was to go to Cadiz, where he would find other instructions.

(f) The ships in Ferrol and Cadiz were to be ready for sea and prepared to join relieving squadrons at the shortest notice.

(g) A frigate was sent to Missiessy with orders for him to remain in the West Indies and to join Ganteaume and Villeneuve on their arrival there.

2. THE ENGLISH COUNTER-OFFENSIVE

While Napoleon was preparing for his great invasion, England was preparing a counterstroke. In the middle of March the English negotiations with Russia had been practically completed as a result of England's promise to place a force of English regular troops, 6000 strong, under the command of the Russian general Lacy, commander of the Russian forces preparing to invade Southern Italy. The English garrison of Malta was to be used for this operation and to replace them fresh troops were to be sent to Malta from England. Accordingly, a convoy of 45 tranports was prepared at Portsmouth, and six battalions were assembled there for service under General Craig. The English Government issued the following orders:

CAMPAIGN ORDER NO. 2

1. Assumption as to enemy intentions—None.
2. General plan—To bring Russia into the war by sending troops to cooperate in an expedition against Southern Italy.
3. (a) A combined force consisting of:
   A convoy of 45 transports carrying General Craig and six battalions of troops.
   An escort under command of Rear Admiral Knight, consisting of the *Queen*, 98, and *Dragon*, 74, and
   The Mediterranean and West Indian Trade convoys, to sail from Portsmouth, and proceed to Cape St. Vincent, the southwestern point of Spain.
   (b) The West Indian Trade Convoy to sail from there to the West Indies.
   (c) The remainder of the combined force to proceed to Gibraltar.
   (d) Two battalions of troops to be left at Gibraltar.
   (e) The remainder of the force to go to Malta.
   (f) Admiral Knight to report with his two ships of the line to Orde off Cadiz as a reinforcement.
   (g) The four battalions of fresh troops to compose the garrison of Malta.
   (h) General Craig to take the 8000 troops of the original garrison, secure Sicily, and report to General Lacy for duty in the expedition to Southern Italy.
   (i) All admirals commanding blockading forces were ordered to guard the expedition while en route to the best of their ability.

Through neglect, the orders to the admirals commanding the blockading forces were not sent out until just before the convoy sailed, so that neither Orde nor Nelson received them.

In the meantime, 40,000 more regular troops were to be prepared for other expeditions to the continent.

You may perhaps think that the landing in Southern Italy of 8000 men was a weak counterstroke. But you must remember that England's object in doing this was largely political. This object was to get Russia into the war, and it was hardly expected that the expedition could do Napoleon any great material damage. But the small expeditions sent out by England had a real importance out of all proportion to their size. As England commanded the sea so completely, a small expedition could strike at Napoleon's weakest point without warning, and could reembark before superior forces could be brought against it. Even Napoleon admitted the effectiveness of these small expeditions. In the Seven Years' War, Pitt had shown how effectively they could be used.

FOURTH LETTER

1. GANTEAUME'S FAILURE

In our last letter we examined the plans of action of the opposing commanders, Napoleon and Pitt. In this letter we will see how these plans were executed.

The leading rôle in the great campaign had been assigned to Ganteaume. In accordance with the Emperor's orders, on March 26 he moved out with his entire squadron to an advanced anchorage, which was protected by heavy batteries.

In the English squadron, Cornwallis, worn out by the hardships of his long watch, had just left on sick leave, and Sir Charles Cotton had been left temporarily in command until his successor, Lord Gardner, should arrive. This arrangement for the commander-in-chief to leave before he was regularly relieved was a very bad one, and its results should teach us a lesson.

The English squadron, six three-deckers and 11 two-deckers, 23 units in all, stood in close to the port, and Ganteaume saw that unless he waited for bad weather he would have to fight his way out. He had three three-deckers and 18 two-deckers, 24 units in all, so that forces were practically equal in numbers. He was therefore inferior in fighting strength in the ratio of about 3 to 4. and he very wisely, and in accordance with his instructions, declined

an engagement. He therefore decided to wait for bad weather. Fortunately for him, the next day a thick fog blew in. He at once got under way and stood out. But he had no more than left the harbor when the fog cleared up and he saw the English squadron in the offing. Cotton at once stood in as if to attack. Ganteaume, who had moored as soon as the English squadron had been made out, got under way again and formed line of battle. Cotton stood in until he was about five miles distant, but not feeling justified, in the absence of the commander-in-chief, to deliberately bring on an action, he drew off, leaving an observation squadron of four ships to watch Ganteaume, who returned to his advanced anchorage. Here the English let slip a priceless opportunity of ending the campaign before it had begun. The lesson we should learn from this is that in naval warfare there are few opportunities for decisive action, and that the side which is superior in fighting power, and consequently desires the decision, must take advantage of every opportunity. In order that this may be done, each subordinate must be trained to act upon his own initiative, and when an opportunity is offered, he must act without waiting for the commander-in-chief to arrive or for him to issue orders.

But while Cotton lost his great opportunity to decide the whole campaign, still he effectively prevented Ganteaume from sailing. Three days later a strong wind came up from the south-southwest and Ganteaume was forced to reenter the harbor of Brest. Thus, at the very beginning of the campaign, it was practically ruined by the failure of the Brest and Ferrol squadrons to escape. The English held the greater part of the allied fleets securely under lock and key, and the very English squadrons which guarded them could hold the Channel and beat off any attempt of the remainder of the allied fleets to break through to assist the crossing of the flotilla.

2. VILLENEUVE'S ESCAPE FROM TOULON

While the important part of the great campaign was working out so poorly for Napoleon, the minor operation was having greater success.

On the afternoon of March 30, Villeneuve sailed from Toulon. Only two frigates were off the port. As he heard that Nelson was off the Spanish coast, and this was actually a fact, he laid his course almost south, intending to pass around outside Majorca and

then to head for the Straits. He had 11 two-deckers, the same ships that were with him on the occasion of his first attempt to escape, and eight cruisers, carrying in addition to his regular crews about 3000 troops. On the 31st, he was followed by the English cruisers, but during the night both of them left him. The next morning Villeneuve had the good fortune to learn from a neutral merchant ship that Nelson was no longer off the Spanish coast, but at Palmas, on the southwestern coast of Sardinia. Upon hearing this most important information, he headed west until he reached the Spanish coast, along which he ran unseen by any English cruisers. On April 7, he hove to in almost a dead calm off the Spanish port of Carthagena. Although it was not in his letter of instructions, he, with very commendable initiative, asked the Spanish admiral, Salcedo, to join him with his six ships. For some unknown reason the ships at Carthagena had been left out of Napoleon's plan, although it was evidently very desirable that they should join in the great combination. As Napoleon must have had some good reason for leaving them out of his letter of instructions to Villeneuve, we may assume that he had been misinformed as to their readiness for sea. Here we have an example of the fact that the superior at the time when he issues the orders, especially when he is distant from the theater of operations, cannot have as reliable information as to the true situation as the subordinate actually on the spot can have at the time when he is actually executing the orders. As the order is not based on the most accurate information and the latest information, the subordinate must, in order to execute it intelligently, be prepared to modify it to suit the actual situation he finds. It is thus of assistance to the subordinate for the superior to describe the situation as he knows it at the time he issues the order, so that the subordinate will know whether or not he will be justified in modifying it. The subordinate by an intelligent use of his initiative may save the superior from committing many errors, and it was in this way that Villeneuve was about to strengthen the Emperor's plan very materially by the addition of the six ships of the Carthagena squadron, which had been omitted from the Emperor's orders.

Salcedo replied to Villeneuve's invitation to the effect that he would be glad to leave with him if Villeneuve would wait 48 hours until he could get permission from Madrid and get his powder on board. At this point the moral factor came into play. Villeneuve

knew how desirable it would be to have six more ships, but on the other hand he knew that he could not afford to have an action with Nelson. As he had no information of the latter's whereabouts, he feared that he would come over the horizon at any minute. He was in a situation which required a commander of great resolution. Villeneuve had the necessary intelligence, but he did not have the necessary resolution. As the wind was favorable he dared not wait, but got under way and stood away for the Straits. This decision had a far-reaching effect, as these six ships took no further part in the campaign and were thus absolutely wasted.

There is an interesting point about Villeneuve's decision: He knew that it would be desirable to rally the six ships, but did he know that the success of Napoleon's great invasion project might well have depended upon his decision? It is true that his orders did not tell him more than that he was to meet Ganteaume in the West Indies, except for a hint that his squadron was destined for an operation of greater importance than that which had been originally assigned to it—an attack upon English colonies in the West Indies. If he had actually known that he was to assist in an attack on England, and might possibly command this attack in person, is it not very probable that, considering the probability that Ganteaume could not escape, he would have recognized the necessity for collecting every possible ship and would therefore have waited for Salcedo, regardless of the possibility of Nelson's appearance?

You will now claim that Napoleon had violated a principle of order-writing in not telling his subordinate his general plan of action, so as to guide his conduct in unexpected situations. While this principle is certainly a sound one, I cannot agree in this case with your criticism. We must remember that Napoleon was in an exceptional situation, He was surrounded by spies and traitors, and if he had confided his plan to Villeneuve, it is very probable that it would soon have become general knowledge. Therefore, as he counted so much upon secrecy and surprise, his plan would have been ruined, even though Ganteaume and Villeneuve might effect their concentration in the West Indies successfully. Thus we see that there are exceptions to even the most important principles, and that Napoleon's violation of this principle can be justified by the exceptional conditions under which he was working.

3. VILLENEUVE AND ORDE OFF CADIZ

Villeneuve, continuing along the Spanish coast, passed through the Straits April 9. While passing through them, he was sighted by the English ship-of-the-line *Renown,* which Nelson had detached to escort a convoy through the Straits. *Renown* set all sail toward Cadiz to warn Orde. The latter was watching Gravina in Cadiz and had the following ships of the line:

Glory (flagship)	98 guns.
Defense	74 guns.
Polyphemus	64 guns.
Agememnon	64 guns.
Ruby	64 guns.
A total of	6 units.

On this day he happened to be taking on provisions and each ship had a supply ship alongside, when the *Renown* was seen coming up with the signal flying that a superior French squadron was in sight. Orde at once cast off the supply ships, gave them orders to anchor in neutral waters off Cape St. Vincent, and himself, forming line of battle, slowly followed them.

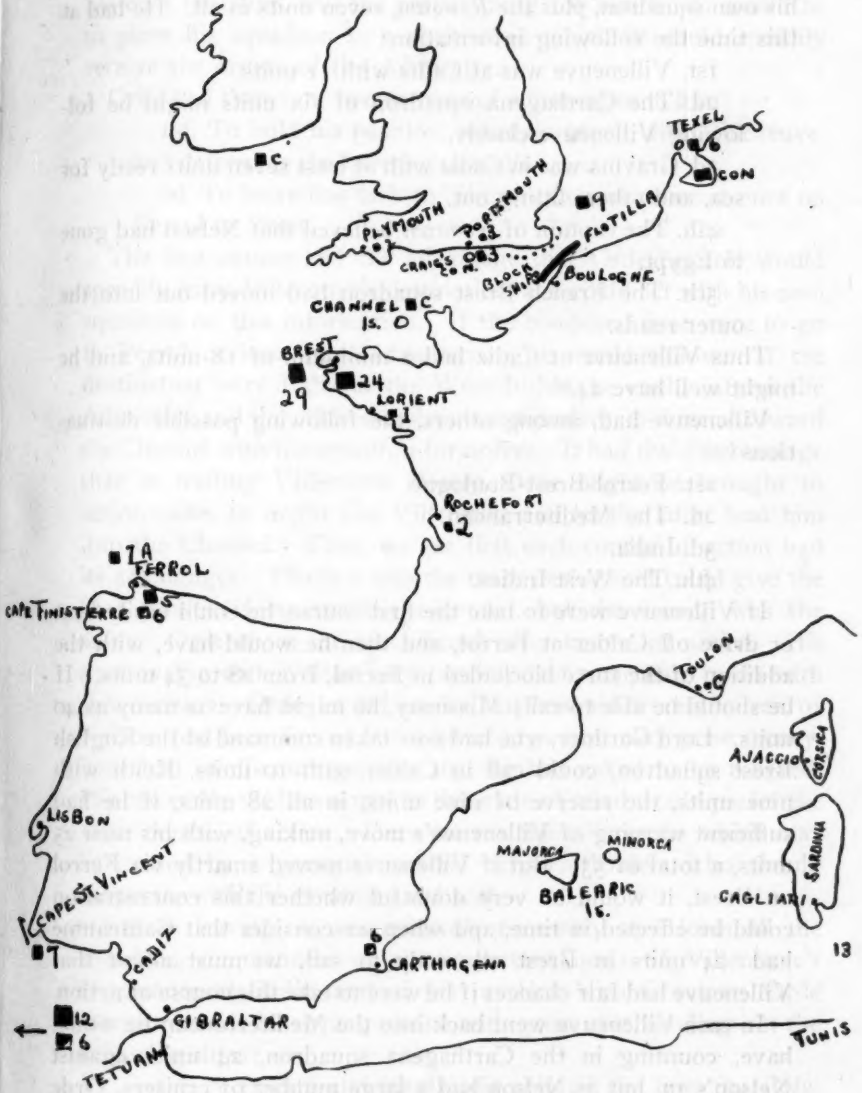
Villeneuve's one idea seemed to be to rally the Spanish ships and get away with the greatest possible speed. This was certainly proper, but here was a real opportunity to accomplish something by beating Orde's very inferior force. You may say that to pursue and fight Orde would be an eccentric movement, one in which a local tactical success might be gained, but one which would in no way assist the execution of the general plan. There is some truth in what you say, and it is indeed a sound principle that everything you do should contribute toward the execution of the general plan laid down by the higher authority. Now you say: "Suppose that Villeneuve had been able to come up with Orde. Then all Orde's ships would be sunk or, at the least, very severely handled. But would not an equal number of Villeneuve's ships be so damaged that they would not be able to go with him to the West Indies? Would not this interfere directly with the execution of Napoleon's plan?" I must admit that looking at the matter from the material point of view the losses would probably be about even. But we must never forget the moral factor in war. Did not Napoleon himself say that "in war the moral is to the physical as three to one"? It is a well-known truth that the first success, no matter how small it may be, in a campaign, is of practically incalculable

importance. Consider therefore the effect of a French victory at the beginning of the campaign, the first one gained since the time of Suffren! Would it not have a tremendous influence not only upon Villeneuve's small force, but upon the entire allied navies? Admitting that six French ships of the 18 of the combined fleet were damaged and had to stay at Cadiz, would not it be better to have 12 ships with their crews flushed with victory than to have 18 with their crews in the condition they were actually in? For purely moral reasons, therefore, I hold that Orde should have been pursued and beaten.

I fear you will say that I have broken my promise not to indulge in criticism, but I wished to show how important the moral factor is, and how very essential it is to gain the first success. But let us see why the French commander failed to pursue Orde. First, the French tradition was to always gain an ulterior object without fighting, and therefore Villeneuve's decision was in accordance with the traditions of his service. Second, he was overawed by Nelson's reputation, and consequently all he thought of was to get away before Nelson could come up to him. This is no disgrace, as all great captains have been able to impose upon their opponents. Even Napoleon once admitted that he had been fooled by the Archduke Charles' reputation. Thus we cannot blame Villeneuve for his error, as it was a very natural one and one which any accomplished commander might make, especially when opposed by such a man as Nelson.

Villeneuve thus made no effort to pursue, but anchored off the port, sending in a frigate to signal Gravina and the French ship *Aigle* to join him. The latter ship joined promptly and Gravina acted with very commendable speed, so that by 2 a. m. the greater part of his division was under way. Villeneuve got under way at 1 a. m. and with undue haste stood away to the southwest, the Spanish ships following one by one. The next morning only one Spanish ship, Gravina's flagship, was in sight. It was not until the 13th that one more Spaniard was picked up. Villeneuve then headed at full speed for the West Indies, where the other four Spanish ships, having sealed orders, joined him. He was extremely lucky to so quickly assemble his widely scattered ships. His haste in sailing happened thus to have no bad result.

Now let us estimate the situation from Orde's point of view and see what courses of action were open to him. After he had made good his escape, he took up his position off Cape St. Vincent with



POSITIONS, APRIL 12.

Leeward Is.	7
Jamaica	4
India	9
En Route San Domingo to France	6

his own squadron, plus the *Renown,* seven units in all. He had at this time the following information:

1st. Villeneuve was at Cadiz with 11 units.

2d. The Carthagena squadron of six units might be following Villeneuve closely.

3d. Gravina was in Cadiz with at least seven units ready for sea, and others fitting out.

4th. The captain of *Renown* believed that Nelson had gone to Egypt.

5th. The French Brest squadron had moved out into the outer roads.

Thus Villeneuve at Cadiz had a minimum of 18 units, and he might well have 24.

Villeneuve had, among others, the following possible destinations:

1st. Ferrol-Brest-Boulogne.

2d. The Mediterranean.

3d. India.

4th. The West Indies.

If Villeneuve were to take the first course, he could easily beat or drive off Calder at Ferrol, and then he would have, with the addition of the force blockaded in Ferrol, from 28 to 34 units. If he should be able to rally Missiessy, he might have as many as 40 units. Lord Gardner, who had now taken command of the English Brest squadron, could call in Calder with 10 units, Keith with nine units, the reserve of nine units, in all 28 units, if he had sufficient warning of Villeneuve's move, making, with his own 25 units, a total of 53. But if Villeneuve moved smartly via Ferrol on Brest, it would be very doubtful whether this concentration could be effected in time, and when we consider that Ganteaume had 24 units in Brest all ready to sail, we must admit that Villeneuve had fair chances if he were to take this course of action.

In case Villeneuve went back into the Mediterranean he would have, counting in the Carthagena squadron, 24 units against Nelson's 13, but as Nelson had a large number of cruisers, Orde believed that he would be able to avoid action and at the same time prevent Villeneuve from accomplishing anything of importance. Nelson was worth a host in himself; he would be able to take care of his station no matter what odds were brought against him.

In case Villeneuve went to India or to the West Indies, then Orde would be hardly justified in following him with his small force on

his own initiative, and the proper thing for him to do would be to place his squadron in a position in which he could speedily receive the orders of the Admiralty.

Orde had therefore two courses of action open to him:

1st. To hold his position, maintain touch with Villeneuve, and determine the latter's destination.

2d. To leave this task to his cruisers, and retire at once on Ferrol or Brest.

The first course had the advantage that Orde himself would speedily learn Villeneuve's destination, and could act with his own squadron on this information. If the combined fleet were to go to Ferrol or into the Mediterranean he would follow. If the destination were India or the West Indies, he could inform the Admiralty and the other squadron commanders, and retire toward the Channel with his squadron for orders. It had the disadvantage that in trailing Villeneuve closely, Orde might be brought to action; also, he might lose Villeneuve and let the latter beat him into the Channel. Thus, we see that each course of action had its advantages. The first was the more daring and could give the best results, if successfully executed, but the second was the safer. Orde chose the second and safer course of action. His controversy with Nelson very possibly had something to do with this decision. Orde, an old enemy, but now a sincere admirer, of Nelson, had been forced into a bitter argument over prize money. This had so discouraged him that he had asked to be relieved. We can easily see how a man in this state of mind would prefer the safer course of action. Here we see the evil results which may be caused by a personal quarrel between leaders who should cooperate with the greatest good-will.

Before leaving, it was evidently necessary to inform all the squadron commanders of the important news of Villeneuve's appearance at Cadiz, and of his junction with Gravina. Orde therefore made his arrangements with great care, sending out the following ships:

1st. A frigate and his fastest ship of the line, the *Polyphemus,* to the Admiralty.

2d. A merchantman to Nelson.

3d. A cruiser to the West Indies.

4th. A transport to Madeira to warn the East India trade.

5th. He himself was to warn Calder and Cornwallis.

When these ships had been sent out on their errands of information, only the frigate *Amphion* and two sloops remained to watch Villeneuve. After his well-reasoned decision had been made, Orde with his remaining six units stood to the northward. On April 25 he passed the rendezvous off Cape Finisterre where one of Calder's frigates should have been on watch. As there was no cruiser there, he passed on to Calder's station, and as nothing was sighted, he assumed that he had left the station. Orde then further retired on Gardner at Brest, joining him about the beginning of May.

4. NELSON'S STRATEGY

We must now trace Nelson's movements during the time when Villeneuve was escaping to the West Indies and Orde was retiring on Brest. We remember that he was off Toulon in the middle of March with his entire squadron. At this time his squadron consisted of 14 units, one ship joining him after his return from Egypt. Nelson saw that Villeneuve was preparing for another movement. The enemy might move east against positions in the Middle and Eastern Mediterranean or west out through the Straits. These two possibilities could be covered only by taking up a position directly off Toulon. This, however, was not in accordance with Nelson's principles, because he wished to lure the French out to sea so that he could force a decision. Again, it would be impossible to maintain this position with his whole squadron, because there was no base nearer than Sardinia, and it would be necessary for him to detach ships from time to time to go to this base to fill up with water and provisions, thus giving Villeneuve a superiority of force. Therefore it was not possible for him to cover both routes. He believed that the eastern route was the more probable and decided that Palmas, on the southwestern coast of Sardinia, was the best position from which to cover this route. To deter the French from taking the western route he purposely showed himself with his entire squadron off the Spanish coast at Cape St. Sebastian, which is due north from Majorca, and, leaving a cruiser on this station, sailed for Palmas to cover the eastern route.

Nelson arrived at Palmas about the beginning of April. He had received no information nor orders from the Admiralty since November, as both dispatch vessels sent to him had been lost. But soon after his arrival he heard that the *Levant* convoy had been attacked and had been forced to put into Gibraltar. He at once detached the *Renown*, which was due for a refit, to see the convoy

POSITIONS, APRIL 26.

Leeward Islands	1
Jamaica	10
India	1–9
En Route San Domingo to France	6
En Route Cadiz to Martinique	12 6

through the Straits. *Renown* had just completed this duty when, as we have seen before, she sighted Villeneuve and went off to warn Orde.

This reduced his squadron at the beginning of the campaign to 13 units, as follows:

Victory	100 guns.
Royal Sovereign	100 guns.
Canopus (Rear Admiral Lewis)	80 guns.
Spencer	74 guns.
Leviathan	74 guns.
Tigre	74 guns.
Donegal	74 guns.
Conqueror	74 guns.
Superb	74 guns.
Belle Isle	74 guns.
Swiftsure	74 guns.
Frigates: *Active, Amazon* and *Decade.*	
A total of	13 units.

On April 4, when the squadron was under way off Palmas, one of the two cruisers detailed to observe Toulon ran in with the news that on the morning of March 31 she had left Villeneuve about 60 miles south by west from Toulon. It was therefore evident that Villeneuve had heard of Nelson's presence off Cape St. Sebastian and was steering well to the southward to keep clear of the Spanish coast. Nelson's ruse had been completely successful.

Nelson now had the same problem to solve as he had had at the time of Villeneuve's first escape. He decided to use the same plan he had used before. He was this time in a far better position to employ this plan than he had been the first time he had used it, as his squadron was already in a central position, at the southern end of Sardinia, and as he had abundant cruisers to cover the entire line, Corsica-Sardinia-Tunis. Five cruisers were placed in the widest gap, between Tunis and Sardinia. Another was stationed off the northern end of Sardinia to cover the passage between this island and Corsica, while a seventh was sent to Naples to watch the gap between Corsica and Italy. The battle squadron took position off the south end of Sardinia.

On the afternoon of April 4 the second cruiser, which had been following Villeneuve, came in, but could report nothing except that Villeneuve had kept on to the southward during the day of March 31, but had disappeared during the night. Nelson sent this ship back to look into Toulon to see if Villeneuve had returned to port.

NELSON'S SECOND MEDITERRANEAN CRUISE, 1805.

After waiting two days without information from his scouts, Nelson was convinced that Villeneuve did not intend to pass between Sardinia and Tunis, as with the five cruisers and the battle squadron this area had been covered thoroughly. However, there was a chance that Villeneuve might have passed to the northward of Sardinia, as the scouting line was thinner in that area. Nelson therefore went with his battle squadron to the eastward to a position about 50 miles north of Palermo, Sicily, arriving on April 7. He also shifted his line of scouts to the northward. By the 10th no news had come in from the cruisers. On this day the most startling news came to him from the English Minister at Naples. It was to the effect that Craig's expedition, of which as yet he had heard nothing, had already sailed from England for Gibraltar. Villeneuve's accidental sailing at exactly the same time made it look as though he had sailed deliberately to meet it. This consideration induced Nelson to go to the west, especially as his wait in the Middle Mediterranean had practically convinced him that Villeneuve had not come to the eastward. But as there was still a slight possibility that Villeneuve might still come to the eastward, Nelson would go to the west along the route Villeneuve would probably use if he were coming eastward; that is, the route: southern end Sardinia—southern island of the Balearic Group—Gibraltar.

By April 15, Nelson had just reached the southern end of Sardinia, having been held up by bad weather. On this day a frigate came in with a letter from Naples which repeated the information that Craig's convoy had sailed before the end of March. On April 17 he received word from a neutral merchantman that Villeneuve had been seen passing through the Straits. He then headed directly for Gibraltar, leaving behind five frigates to guard Sardinia, Sicily and Egypt against minor expeditions which the French might fit out at Toulon. He could not afford to leave any ships of the line to watch the Spanish ships at Carthagena and had to trust that their inactivity would be continued.

On April 19 he received news from a brig sent out from Gibraltar that Villeneuve had passed through the Straits 10 days before, and that he had touched at Cadiz and sailed from there in company with some Spanish ships. The merchantman sent by Orde seems never to have met him.

On May 4 he anchored in Tetuan Bay to take on provisions and water. His second in command, Rear Admiral Bickerton, was left as commander-in-chief of the Mediterranean station, with about 20 frigates in all under his orders. He was to have any reinforcement which might arrive from England.

Nelson had now completed his work in the Mediterranean. Let us give a brief summary of his operations. His plan had been very similar to that which he had used on the occasion of Villeneuve's first sortie, except that this time he had been able to observe the line from Sardinia south to the African coast, across which Villeneuve must pass in order to gain Greece or Egypt unobserved by neutrals. This allowed him to dispense with the trip to the Eastern Mediterranean which he had been forced to make before. He had practically cleared up the situation in the Middle Mediterranean when he had heard of Craig's expedition. This made it seem as though Villeneuve had gone to the west, and so Nelson had proceeded in that direction, still maintaining, however, as long as possible en route, a position which would cover the Middle Mediterranean. Finally, he had received news from Gibraltar that Villeneuve, instead of returning to port as he had done before, had passed out through the Straits. Then he had definitely decided to leave the Mediterranean, forming a cruiser squadron to maintain the command of that sea during his absence. His sound and methodical strategy cannot be too highly praised.

Now he had solved the first part of the problem successfully. But here a second and even harder problem had to be solved. His theater of operations had been the small Mediterranean Sea; now it was to be nothing less than the world. He must determine where Villeneuve had gone and what course of action he should take to counter the move of his opponent. He must make the same estimate of the situation which Orde had to make a month before.

Just as Orde had thought at this time, so Nelson at first believed, that Villeneuve had gone to Ferrol and then to the Channel. After he had arrived at Tetuan Bay Nelson received news from the naval commissioner at Gibraltar that absolutely nothing had been heard of Villeneuve and that it was the general opinion that he had gone to the West Indies. Nelson's great problem now was

to decide whether the combined fleet had gone to the Channel or to the West Indies.

5. Craig's Expedition and Nelson's Decision

On April 17, and not before the end of March, as Nelson had heard, and before any news had come in about Villeneuve's escape, Craig had sailed with his great convoy from Portsmouth. He was escorted by the *Queen,* 98 guns, and the *Dragon,* 74 guns, under the command of Rear Admiral Knight.

I beg to remind you that when Orde retired he left one frigate, the *Amphion,* and two sloops, the *Wasp* and the *Beagle,* all under the command of Captain Sutton. This officer was ordered to watch Cadiz and to gain information of the movements of the combined fleet. The *Beagle,* at the time Orde left, was cruising in the Straits, and Sutton never even heard of her again. As we will learn later on, she had left the station on important detached service. The *Wasp* was sent toward Cadiz and an officer in a Portuguese boat made a daring reconnaissance of the port. He returned with the information that the entire combined fleet was in Cadiz. This was somewhat remarkable when we consider that Villeneuve was 17 days out on his way to the West Indies at this time. Still I venture to say that even stranger reports have been made, and misinformation is one of the things we must always allow for. This news was forwarded to Lisbon. At this place news had just been received from a merchant captain, who claimed that he had seen the combined fleet on their way to the West Indies. Which of these utterly contradicting statements were to be credited? At Lisbon it was decided that the word of a naval officer was to be taken before that of a merchant captain, a good rule too, and accordingly on May 2 information that Villeneuve was in Cadiz was forwarded to the Admiralty. We will see the effect later which this very startling news had. The frigate *Orpheus* was sent from Lisbon to warn Craig, whom they knew was close at hand. The frigate met him with this news, and on May 4 the entire convoy and escort sailed up the Tagus and anchored at Lisbon inside the fortifications. This was a clear breach of Portugal's neutrality, but the English commanders were so little bothered with such considerations that they made preparations to land troops and seize the fortifications in case of Villeneuve's appearance.

I expect you would consider it strange if I were to pass over this point without comment, but I am sure you recognize that a naval officer is treading upon dangerous ground when he talks upon such a subject. But fortunately my reticence is a matter of no moment, as one of our great international moralists has covered the point very completely. I beg you allow me to insert, contrary to my custom, a quotation from Mr. Roosevelt, whose opinions you no doubt know already. In his "Naval War of 1812," p. 305, he says:

> I do not allude to the mere disregard of neutrality. Whatever international moralists may say, such disregard is a mere matter of expediency. If the benefits to be gained by attacking a hostile ship in neutral waters are such as to counterbalance the risk of incurring the enmity of the neutral power, why then the attack ought to be made. Had Hilyar, when he first made his appearance off Valparaiso, sailed in with his two ships, his men at quarters and guns out, and at once attacked Porter, considering the destruction of the *Essex* as outweighing the insult to Chili, why his behavior would have been perfectly justifiable.

I give you this opinion of probably our greatest international moralist with great care to give neither my approval nor disapproval.

To go back to our story, the *Orpheus* was sent out again from Lisbon to clear up the situation at Cadiz. But when she reached Cape St. Vincent, she met the *Amazon*, a frigate which Nelson had sent on to get information at Lisbon. Thus the *Orpheus* learned that Villeneuve was not at Cadiz and that Nelson was coming up, while the *Amazon* learned that Craig and Knight were at Lisbon. The *Orpheus* returned at once to Lisbon, while the *Amazon* remained off St. Vincent to wait for Nelson.

Meanwhile, as the wind was fair, Nelson decided not to wait longer at Tetuan and so ran over to Gibraltar. Admiral Campbell, an English officer in the Portuguese service, assured him that the combined fleet had gone to the West Indies. This shows one advantage of having our officers loaned to other navies. On May 6 Nelson sailed from Gibraltar and went toward Cadiz. On May 9 he reached Cape St. Vincent and completed his provisioning from the supply ships which Orde had left there. On the night of this day the *Amphion* joined him, and Captain Sutton, whom Orde had left on the station when he retired, was able to assure Nelson that for all of three weeks since the sailing of the combined fleet, absolutely no news of it had been received anywhere between

Lisbon and Brest. An hour later the *Amazon* came up and gave in the report of an American merchant captain who had been in Cadiz the time the combined fleet sailed. The report stated that the gossip in Cadiz was to the effect that the fleet was going to the West Indies, an example of the way secret orders became public in the French Navy. In addition, Nelson doubtless knew of the report received in Lisbon from the merchant captain who had seen the combined fleet at sea on their way to the West Indies. This accumulated evidence convinced Nelson that Villeneuve had sailed to the West Indies.

This point settled, what was Nelson to do? You will perhaps say that he should sail without the slightest hesitation after the combined fleet. But the problem was not quite as easy as this. Suppose the Admiralty had already sent a powerful squadron from the Channel after it. Then if Nelson were to follow too, suppose Villeneuve were to return to the Channel, when two English squadrons, in addition to Cochrane, were in a distant area. Did the doctrine of the English naval service give him any clew upon this point? I believe it did. We might say that it was a part of their doctrine that whenever an enemy squadron escaped, it was the duty of the blockading squadron:

1st. If the destination of the enemy were unknown, to rally on the Brest squadron.

2d. If the destination were known to be a foreign station, to follow, unless hopelessly inferior in fighting power, in which case the blockading squadron should retire toward the Channel for orders.

In accordance with these principles, Nelson had first decided to retire toward the Channel. After he had been convinced that the combined fleet's destination was the West Indies, he at once decided to follow, as he could be certain that this would be what the Admiralty would wish him to do. It was also what the Admiralty would expect him to do, and therefore the Admiralty would not send a squadron from the Channel after Villeneuve until they had made certain that Nelson had not followed him. Did Nelson have sufficient force to reestablish the English position in the West Indies? If he arrived in the West Indies with 11 units

(for he did not take one of his three-deckers, the *Royal Sovereign*), the following would be the position in that area:

Allied forces.	Two squadrons:	First, Villeneuve ...	18 units.
		Second, Missiessy ..	6 units.
			24 units in all.
English forces.	Three squadrons:	First, Dacres	4 units.
		Second, Cochrane.	7 units.
		Third, Nelson	11 units.
			22 units in all.

Thus the French were slightly stronger in numbers and much better concentrated, but there could be little doubt but that the greater efficiency of the English ships and Nelson's genius would turn the scale in favor of the English.

But before Nelson could leave he must see Craig safely on his way. On May 11 he met the convoy off St. Vincent. As it would be necessary for Knight to pass the Spanish squadron of six units based on Carthagena, Nelson gave him the *Royal Sovereign* of 100 guns, a fine three-decker. This would give him five units against the six of the enemy. As the *Royal Sovereign* needed docking and was consequently slow, this fact may have contributed to his decision to leave her with Knight.

On the evening of May 11 Nelson headed for the West Indies with one three-decker and nine two-deckers, 11 units in all, and three frigates.

[To be Continued]

(for he did not take one of his three-deckers, the *Royal Sovereign*) the following would be the position in that area:

Allied force. Two squadrons: First, Villeneuve ... 18 units
Second, Magon ... 6 units.

24 units in all.

English force. Three squadrons: First, Nelson ... 4 units
Second, Collingwood ... 7 units.
Third, Nelson ... 11 units.

22 units in all.

Thus the French were slightly stronger in numbers and much better concentrated, but there could be little doubt that the greater efficiency of the English ships and Nelson's genius would turn the scale in favor of the English.

But before Nelson could leave he must see Craig safely on his way. On May 11 he met the convoy off St. Vincent. As it would be necessary for Knight to pass the Spanish squadron of six units based on Cartagena, Nelson gave him the *Royal Sovereign* of two guns, a fine three-decker. This would give him five units against the six of the enemy. As the *Royal Sovereign* needed docking and was consequently slow, this fact may have contributed to his decision to leave her with Knight.

On the evening of May 11 Nelson headed for the West Indies with one three-decker and nine two-deckers, 11 units in all, and three frigates.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

FLOATING THE STORAGE BATTERY ON THE LINE

By LIEUTENANT LUCIUS C. DUNN, U. S. Navy

Although the practice of floating the storage battery on the line has been adopted commercially for a number of years and has registered a marked success in the storage battery engineering world, its general adoption for naval use and its application to the submarine electrical plant are of comparatively recent date. However, owing to the rapidly increasing use of the storage battery as a stand-by agent for the various power circuits as well as other electrical circuits on board ship, floating the storage battery on the line will likewise meet with increased application and will eventually become a regular routine engineering practice in the battery service stations and electrical plants of practically all naval vessels. In fact, this practice has already been adopted as routine on board practically all of our submarines and this article deals mainly with its application to this special branch of our service, but inasmuch as the general principles involved are identical, the subject matter herein contained is, with a few minor exceptions, equally applicable to the electrical plants of all naval vessels equipped for floating their storage batteries on the line.

Floating the storage battery on the line, or the operation of maintaining the battery in a practically constant degree of charge while directly connected in parallel across the bus-bars of the main power units normally supplying current for the exterior load, is best accomplished in the submarine electrical plant through the application of the principle of electromagnetism, which principle is contained in the action of the reverse-current circuit-breaker. The method of using the reverse-current breaker for this purpose is identical with that employed in running dynamos in parallel and, as is well known, when this practice first came into general use, experience proved it highly essential that some means be provided for protecting the machines against serious damage should either of them fail, through break-down or any other cause, to

deliver its designated share of the power required on the line. It being obviously true that when dynamos are working in multiple, the failure of any one of the machines to take its share of the exterior load forces the other machine or machines, as the case may be, to take the additional load, with the possibility of causing the disabled machine to run as a motor. Moreover, depending upon the nature of the break-down and the load on the line in comparison with the ratings of the machines, these may be sufficient to wreck the power units and put the entire plant out of commission.

Hence, the evolution and development of the reverse-current circuit-breaker came as a natural result in offering a protective means against damage to the dynamos and other equipment through accidents of this kind, and, as stated, it is the reverse-current circuit-breaker which has been adapted for use and performs a similar function in the operation of floating the storage battery on the line in the submarine electrical plant.

THE REVERSE-CURRENT CIRCUIT-BREAKER

The reverse-current circuit-breaker, as its name implies, serves to automatically open the circuit when the direction of current flow in the line is reversed. In Fig. 1 is shown a photographic illustration of one of these circuit-breakers and in Fig. 2 is shown the corresponding wiring diagram for this breaker and the method of connecting it in circuit with the generator and bus-bars. In the photograph, Fig. 1, the reverse-current circuit-breaker is shown with portions of the frame-work removed in order that the essential parts necessary to the reversal feature may be clearly shown. The reversal feature of this breaker consists of two separate electromagnetic systems as follows:

1. A series magnetic system.
2. A shunt magnetic system.

The series magnetic system consists of the following parts:

(a) Series magnetic coil *A* in series with the main switch member of the breaker and designed to carry the entire line current.

(b) Series magnetic core *B* surrounded by the series coil *A*, while to each end of this core is attached a pole piece, one of which marked *E*, may be plainly seen in the photograph. The core *B* is mounted on frictionless bearings which allow a slight angular movement about its axis. One of these bearings, marked *F*, is also shown in the photograph.

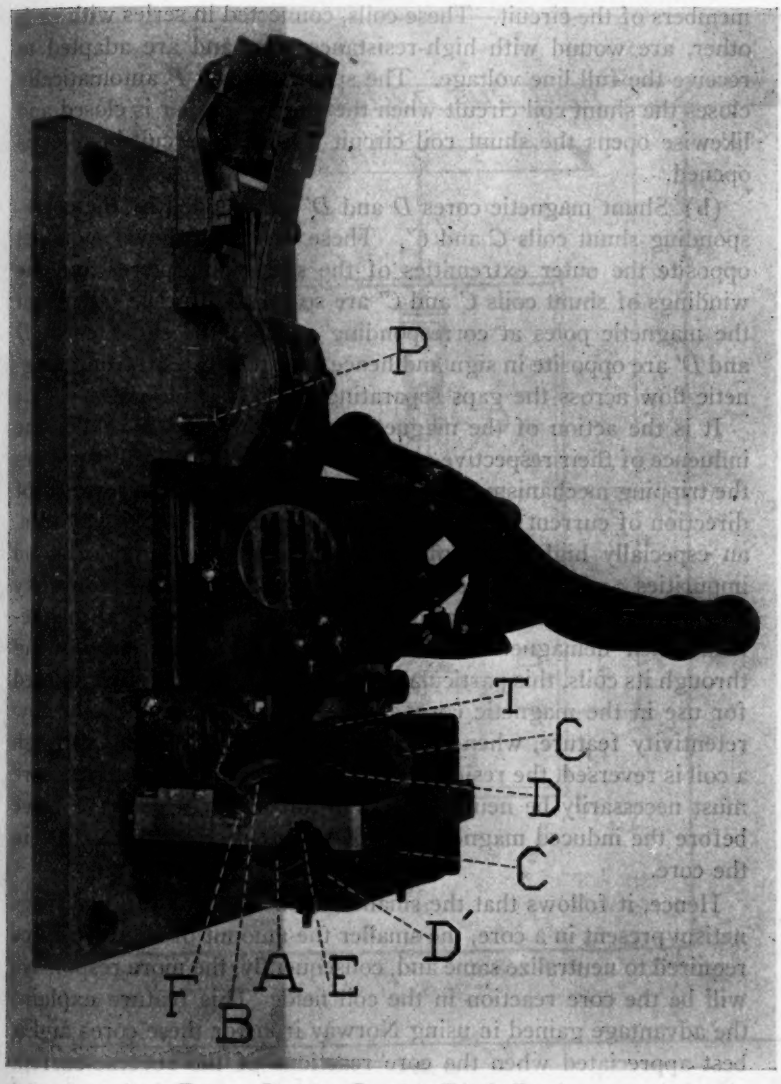


FIG. 1.—Reverse Current Circuit Breaker.

The shunt magnetic system consists of the following parts:

(a) Shunt magnetic coils *C* and *C'* shunted across the main bus members of the circuit. These coils, connected in series with each other, are wound with high-resistance wire and are adapted to receive the full line voltage. The spring contact *P* automatically closes the shunt coil circuit when the circuit-breaker is closed and likewise opens the shunt coil circuit when the circuit-breaker is opened.

(b) Shunt magnetic cores *D* and *D'* surrounded by the corresponding shunt coils *C* and *C'*. These cores are shown mounted opposite the outer extremities of the series pole pieces and the windings of shunt coils *C* and *C'* are so related to each other that the magnetic poles at corresponding ends of the shunt cores *D* and *D'* are opposite in sign and hence tend to create a strong magnetic flow across the gaps separating the respective poles.

It is the action of the magnetic cores *B*, *D* and *D'* under the influence of their respective coil fields which mechanically operates the tripping mechanism *T* for opening the circuit upon reversal of direction of current flow. These cores are made of Norway iron, an especially high-grade of soft iron containing practically no impurities, and due to its softness, permeability and low retentivity or capacity for retaining a minimum amount of residual magnetism when demagnetized upon cessation of a current flowing through its coils, this particular grade of iron is especially adapted for use in the magnetic cores of this type. Relative to the low retentivity feature, when a magnetizing current passing through a coil is reversed, the residual magnetism or remanence in the core must necessarily be neutralized or deadened by a coercive force before the induced magnetism is of sufficient strength to react in the core.

Hence, it follows that the smaller the amount of residual magnetism present in a core, the smaller the amount of coercive force required to neutralize same and, consequently, the more responsive will be the core reaction in the coil field. This feature explains the advantage gained in using Norway iron for these cores and is best appreciated when the core reactions of the reverse-current circuit-breaker are considered. In this instance, it is essential that the series magnetic core undergo an instantaneous and abrupt change of polarity in order that the tripping mechanism for opening the breaker may be instantly operated upon reversal of current.

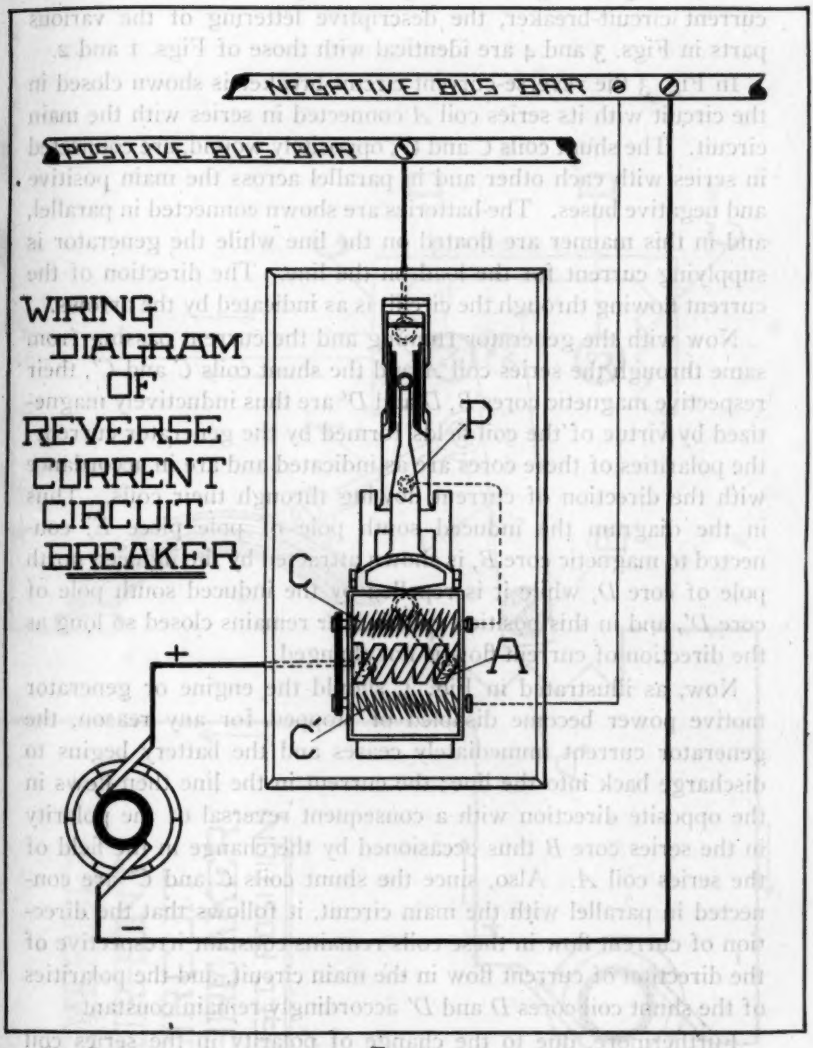

NEGATIVE BUS BAR
POSITIVE BUS BAR
WIRING DIAGRAM OF REVERSE CURRENT CIRCUIT BREAKER
P
C
C'
A
+
−

FIG. 2.

These core reactions may be understood by a study of the elementary wiring diagrams shown in Figs. 3 and 4. For clearness in following through the design and operation of the reverse-current circuit-breaker, the descriptive lettering of the various parts in Figs. 3 and 4 are identical with those of Figs. 1 and 2.

In Fig. 3 the reverse-current circuit-breaker is shown closed in the circuit with its series coil *A* connected in series with the main circuit. The shunt coils *C* and *C'*, oppositely wound, are connected in series with each other and in parallel across the main positive and negative buses. The batteries are shown connected in parallel, and in this manner are floated on the line while the generator is supplying current for the load on the line. The direction of the current flowing through the circuit is as indicated by the arrows.

Now with the generator running and the current passing from same through the series coil *A* and the shunt coils *C* and *C'*, their respective magnetic cores *B*, *D* and *D'* are thus inductively magnetized by virtue of the coil fields formed by the generator current; the polarities of these cores are as indicated and are in accordance with the direction of current flowing through their coils. Thus in the diagram the induced south pole of pole piece *E*, connected to magnetic core *B*, is shown attracted by the induced north pole of core *D*, while it is repelled by the induced south pole of core *D'*, and in this position the breaker remains closed so long as the direction of current flow is not changed.

Now, as illustrated in Fig. 4, should the engine or generator motive power become disabled or stopped for any reason, the generator current immediately ceases and the battery begins to discharge back into the line; the current in the line then flows in the opposite direction with a consequent reversal of the polarity in the series core *B* thus occasioned by the change in the field of the series coil *A*. Also, since the shunt coils *C* and *C'* are connected in parallel with the main circuit, it follows that the direction of current flow in these coils remains constant irrespective of the direction of current flow in the main circuit, and the polarities of the shunt coil cores *D* and *D'* accordingly remain constant.

Furthermore, due to the change of polarity in the series coil core *B*, there occurs a similar change of polarity in the pole piece *E*, and as shown in Fig. 4, the induced north pole of the pole piece *E* is attracted by the south pole of core *D'* and repelled by the north pole of core *D*. This electrical reaction thus resolves itself into mechanically operating the tripping mechanism *T* of the

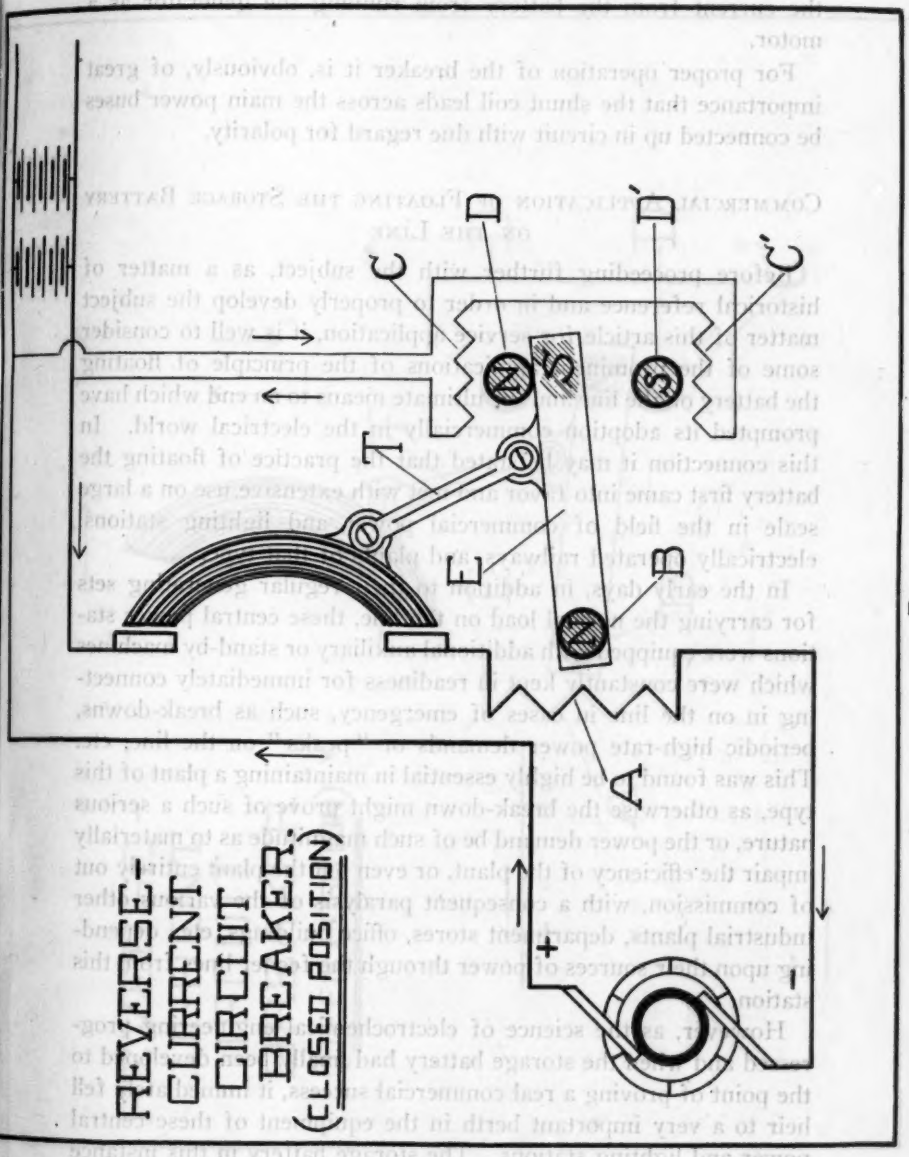

REVERSE-CURRENT CIRCUIT BREAKER.
(CLOSED POSITION)
A
B
C
C'
D
D'
E
T
+
-

FIG. 3.

circuit-breaker, which automatically opens the circuit and prevents the current from the battery from running the generator as a motor.

For proper operation of the breaker it is, obviously, of great importance that the shunt coil leads across the main power buses be connected up in circuit with due regard for polarity.

COMMERCIAL APPLICATION OF FLOATING THE STORAGE BATTERY ON THE LINE

Before proceeding further with the subject, as a matter of historical reference and in order to properly develop the subject matter of this article for service application, it is well to consider some of the prominent applications of the principle of floating the battery on the line and the ultimate means to an end which have prompted its adoption commercially in the electrical world. In this connection it may be stated that the practice of floating the battery first came into favor and met with extensive use on a large scale in the field of commercial power and lighting stations, electrically operated railways, and plants of that type.

In the early days, in addition to their regular generating sets for carrying the normal load on the line, these central power stations were equipped with additional auxiliary or stand-by machines which were constantly kept in readiness for immediately connecting in on the line in cases of emergency, such as break-downs, periodic high-rate power demands or "peaks" on the line, etc. This was found to be highly essential in maintaining a plant of this type, as otherwise the break-down might prove of such a serious nature, or the power demand be of such magnitude as to materially impair the efficiency of the plant, or even put the plant entirely out of commission, with a consequent paralysis of the various other industrial plants, department stores, office buildings, etc., depending upon their sources of power through the feeder lines from this station.

However, as the science of electrochemical engineering progressed and when the storage battery had finally been developed to the point of proving a real commercial success, it immediately fell heir to a very important berth in the equipment of these central power and lighting stations. The storage battery in this instance largely replaced the old stand-by machines and performed the function of a stand-by agent, for owing to its capacity for either giving out or receiving electrical energy, it thus proved a very

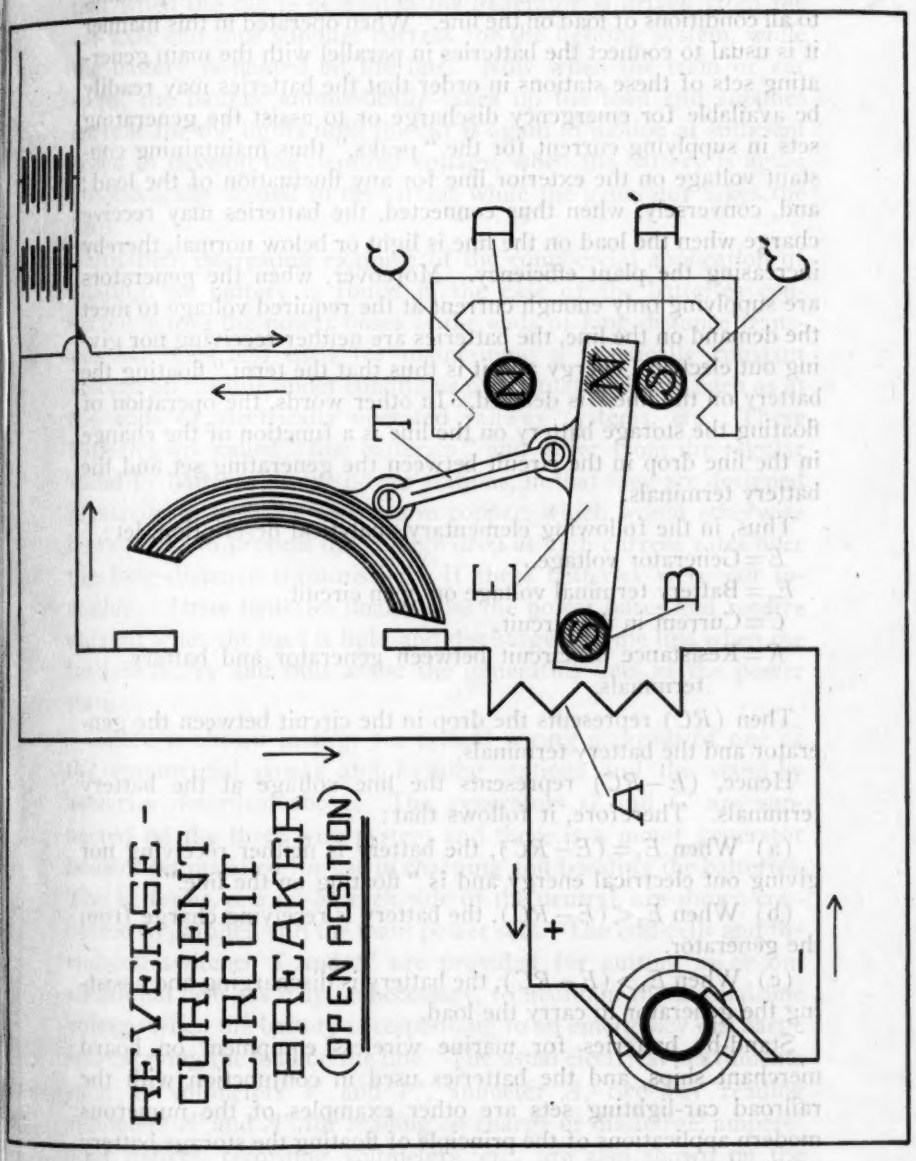

REVERSE-
CURRENT
CIRCUIT
BREAKER
(OPEN POSITION)
C
D
D'
C'
N
N
S
T
E
B
A
+
-

FIG. 4.

flexible unit and one which was entirely capable, within certain definite limitations of its inherent capacity, of readily responding to all conditions of load on the line. When operated in this manner it is usual to connect the batteries in parallel with the main generating sets of these stations in order that the batteries may readily be available for emergency discharge or to assist the generating sets in supplying current for the "peaks," thus maintaining constant voltage on the exterior line for any fluctuation of the load; and, conversely, when thus connected, the batteries may receive charge when the load on the line is light or below normal, thereby increasing the plant efficiency. Moreover, when the generators are supplying only enough current at the required voltage to meet the demand on the line, the batteries are neither receiving nor giving out electrical energy and it is thus that the term "floating the battery on the line" is derived. In other words, the operation of floating the storage battery on the line is a function of the change in the line drop in the circuit between the generating set and the battery terminals.

Thus, in the following elementary analytical description, let:

E = Generator voltage.

E_1 = Battery terminal voltage on open circuit.

C = Current in the circuit.

R = Resistance of circuit between generator and battery terminals.

Then (RC) represents the drop in the circuit between the generator and the battery terminals.

Hence, $(E-RC)$ represents the line voltage at the battery terminals. Therefore, it follows that:

(a) When $E_1=(E-RC)$, the battery is neither receiving nor giving out electrical energy and is "floating on the line."

(b) When $E_1<(E-RC)$, the battery is receiving charge from the generator.

(c) When $E_1>(E-RC)$, the battery is discharging and assisting the generator to carry the load.

Stand-by batteries for marine wireless equipment on board merchant ships, and the batteries used in conjunction with the railroad car-lighting sets are other examples of the numerous modern applications of the principle of floating the storage battery on the line; the latter case presents a very ingenious and compact example of this operation. These modern car-lighting sets consist mainly of a generator, a storage battery, and a suitable

regulating switchboard containing voltmeter, ampere-hour meter, automatic cut-outs, etc., and the operating arrangement is such that when the car is in motion the generator is driven from the car axle and thus supplies current for the lighting system, while the battery is floated on the line. Now when the train or car stops, the battery automatically takes up the load and supplies current for the lights until the car is again in motion at sufficient speed to develop the required voltage, when the battery is again automatically floated in the circuit while the generator takes the load.

Another interesting example of the commercial application of floating the battery is found in the case of the batteries connected across the power buses at the ends of long-distance transmission lines and used for maintaining a practically constant voltage on the line under conditions of fluctuating loads, such as at the ends of electrically operated railway systems, etc. These batteries are called "line batteries" and differ from the regular stand-by batteries in the power stations, in that they are designed primarily to save the increase in copper, which would otherwise be required to prevent the voltage drop at high current rates over the long-distance transmissions, if these batteries were not installed. These batteries float across the power buses and receive current when the load is light and discharge into the line when the load is heavy and thus assist the generating sets in the power station.

There is shown in Fig. 5 a typical wiring diagram of one of the commercial power and lighting stations and the stand-by batteries described above. The generators G and G' are connected on the three-wire system and there is a motor generator booster set installed for use in charging and boosting the batteries. The batteries, one set on each side of the neutral, are shown connected in parallel with the main power sets. The end-cells and the end-cell switches S and S' are provided for cutting in or out additional cells, as may be necessary, to maintain the normal line voltage when the battery is responding to an emergency discharge and carrying the load on the line. The usual electrical instruments such as voltmeters V and V', ammeter A, two-way reading ammeters A' and A'' for reading on charge or discharge, ampere-hour meters, recording voltmeters, etc., are also shown on the diagram. The reverse-current circuit-breakers R, R' and R'' protecting the generating sets are also shown in the diagram.

During the operation of floating, it is usual practice to maintain the batteries in these commercial plants at a voltage of from 2.10 to 2.14 volts per cell, for when maintained at practically this potential, the battery is equally capable of responding for short periods to high rate discharge as well as receiving and absorbing current during intermittent short lulls or power recesses on the line, and this with practically none of the deleterious effects incident to gassing and constant overcharge, such as would be the case if floating at full charge. However, generally speaking, the particular service required of the battery together with the degree of attention which it receives as to care and maintenance must necessarily govern the potential limit for floating.

As an example of the operation of floating the batteries in one of these stations, assume that the line voltage across the positive and negative legs of the diagram, Fig. 5, is 220 volts with a corresponding potential of 110 volts across the legs on each side of the neutral. Also assuming that each cell when floating is maintained at 2.12 volts, then the number of cells required in circuit on each leg in order that normal line voltage may at once be available for "peak" duty or in event of failure of either or both sets of generators, would be

$$\frac{110}{2.12} = 52 \text{ cells.}$$

Also assuming that the limiting voltage of each cell during discharge is 1.60 volts per cell, then the number of cells required in circuit during a discharge of such duration and magnitude as to reduce the cells to this voltage would be

$$\frac{110}{1.60} = 70 \text{ cells.}$$

Therefore, the number of additional cells required to be cut in on the circuit during such emergency discharge, in order to maintain the normal line voltage, would be $70-52=18$ cells. This explains the function of the end-cell switch for cutting in or out cells as may be necessary during a discharge. The end-cell switch, of which there are many different types, is usually motor operated and, generally speaking, is automatically controlled by a contact-making voltmeter connected across the battery terminals. This contact-making voltmeter closes, selectively, the exciting circuits of two relays arranged to operate the end-cell switch, one for either direction of travel, so that when the bus voltage is low, cells

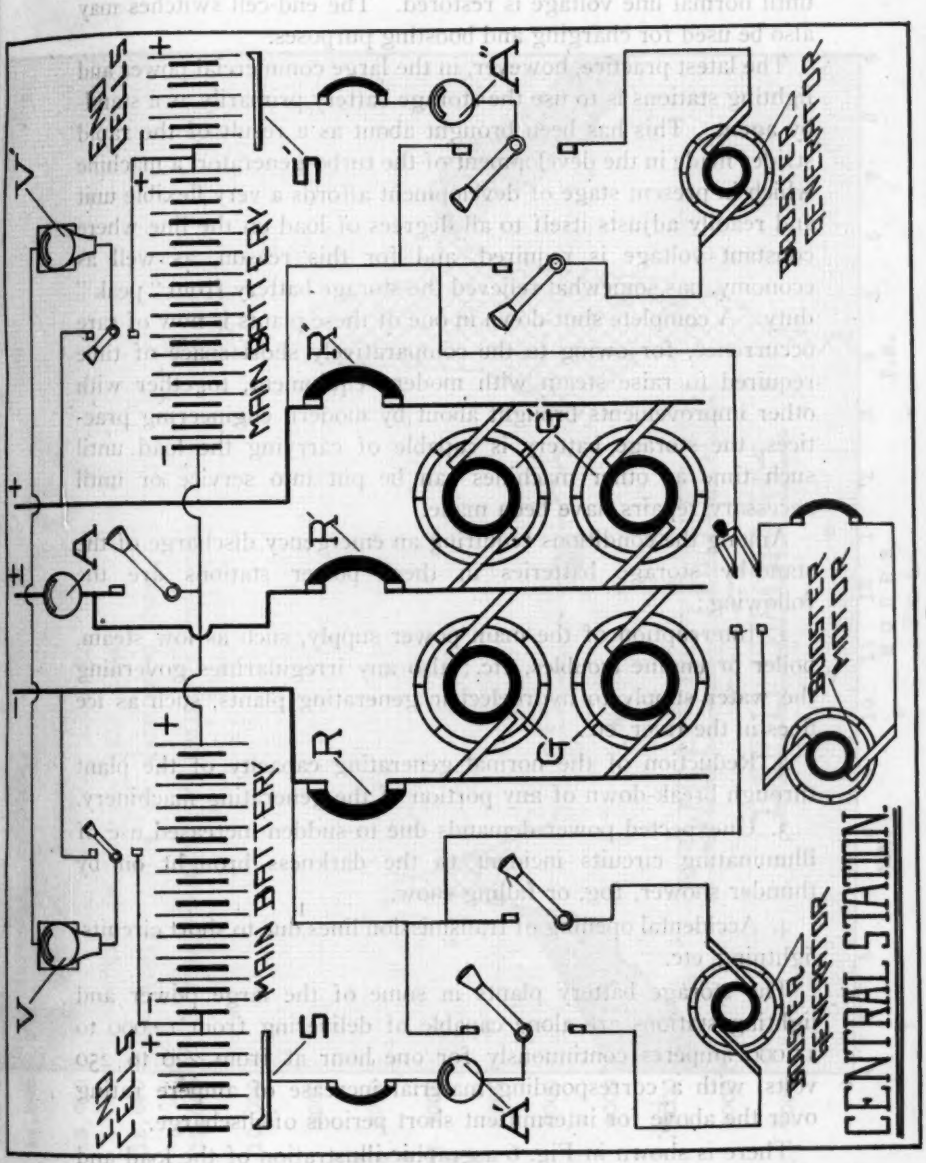

END CELLS
MAIN BATTERY
V'
S'
A'
BOOSTER GENERATOR
R'
G'
A
R
G
BOOSTER MOTOR
MAIN BATTERY
END CELLS
V
S
A'
BOOSTER GENERATOR
CENTRAL STATION.

FIG. 5.

will be cut in, and when the voltage is high, cells will be cut out until normal line voltage is restored. The end-cell switches may also be used for charging and boosting purposes.

The latest practice, however, in the large commercial power and lighting stations is to use the storage battery primarily as a stand-by agent. This has been brought about as a result of the rapid strides made in the development of the turbo-generator, a machine which in present stage of development affords a very flexible unit and readily adjusts itself to all degrees of load on the line where constant voltage is required, and for this reason, as well as economy, has somewhat relieved the storage battery from "peak" duty. A complete shut-down in one of these plants is now of rare occurrence, for owing to the comparatively short space of time required to raise steam with modern equipment, together with other improvements brought about by modern engineering practices, the storage battery is capable of carrying the load until such time as other machines can be put into service or until necessary repairs have been made.

Among the conditions requiring an emergency discharge of the stand-by storage batteries in these power stations are the following:

1. Interruption of the main power supply, such as low steam, boiler or engine troubles, etc.; also any irregularities governing the water supply to hydroelectric generating plants, such as ice floes in the river, etc.

2. Reduction of the normal generating capacity of the plant through break-down of any portion of the generating machinery.

3. Unexpected power demands due to sudden increased use of illuminating circuits incident to the darkness brought on by thunder shower, fog, or falling snow.

4. Accidental opening of transmission lines due to short circuits, lightning, etc.

The storage battery plants in some of the large power and lighting stations are alone capable of delivering from 12,000 to 15,000 amperes continuously for one hour at from 220 to 250 volts, with a corresponding material increase of ampere rating over the above for intermittent short periods of discharge.

There is shown in Fig. 6 a graphic illustration of the load and power distribution curves in one of the central station power plants described above. In this diagram is plotted the total load

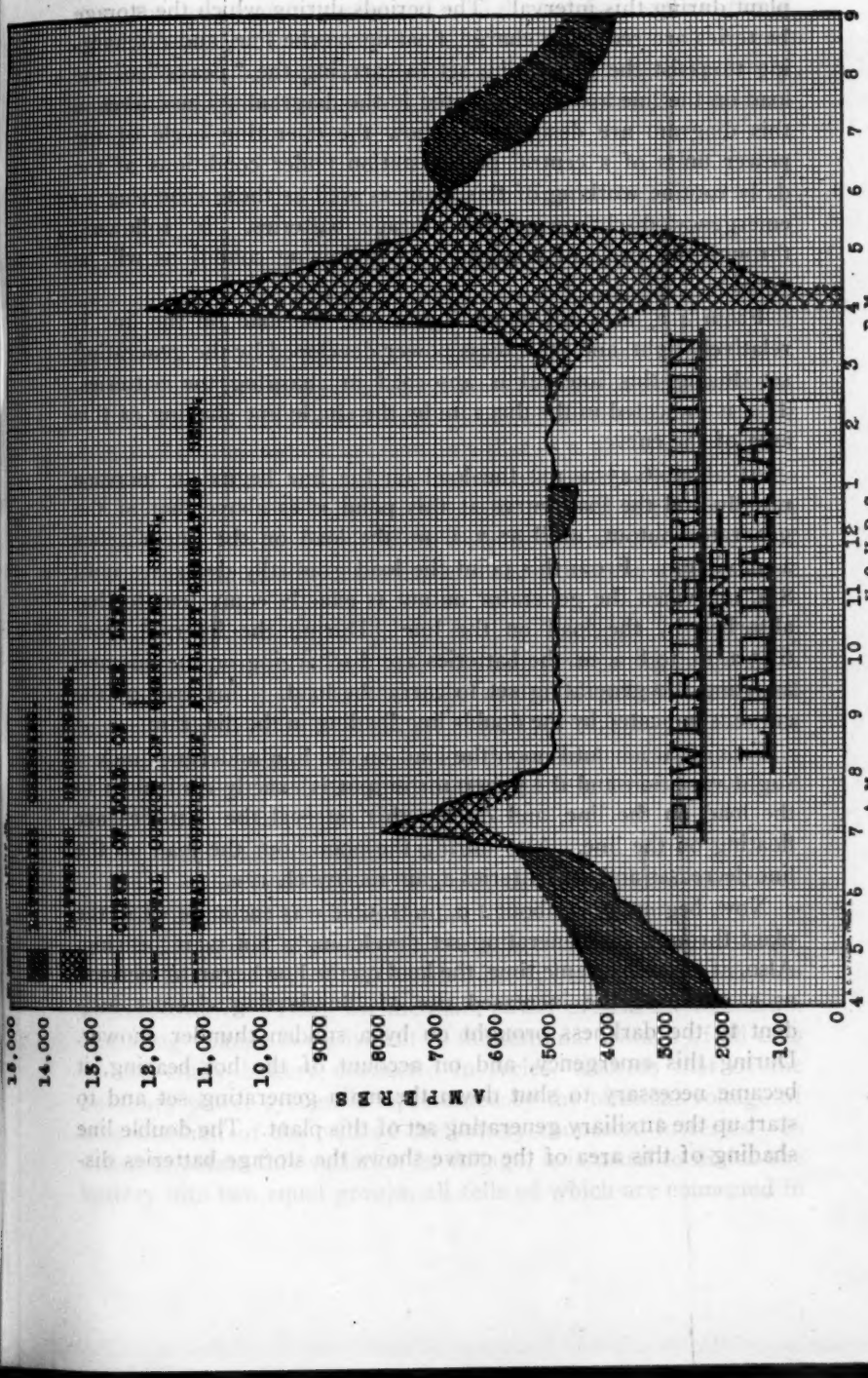

POWER DISTRIBUTION
—AND—
LOAD DIAGRAM.
AMPERES
HOURS
A.M.
P.M.
18,000
14,000
15,000
12,000
11,000
10,000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
4
5
6
7
8
9
10
11
12
1
2
3
4
5
6
7
8
9

FIG. 6.

curve of the power station from 4 a. m. to 9 p. m. and also the curves of the power distribution among the various units of this plant during this interval. The periods during which the storage batteries are receiving charge, floating on the line, and discharging to assist the generating set in carrying the "peaks" of the load on the line are also indicated in the diagram. The curves in this diagram are designed to show the operating cycle of the power units of a central power station under conditions of the daily routine working of this plant as well as those requiring an emergency discharge of the storage batteries. In following through this cycle of operation, the following conditions will be noted:

From 4 a. m. until about 6.30 a. m., the load on the line is relatively light, and the excess power developed by the generating set during this interval is absorbed in charging the batteries. This is indicated in the diagram by the single line shading of this area of the curve.

At about 6.45 a. m., the load on the line begins to increase rapidly and the load curve at this point rises above that of the generator output, until at 7 a. m. the load on the line reaches a maximum. From this point the load gradually decreases until 8 a. m., when the generator output is exactly equivalent to that absorbed by the load on the line. During the interval from 6.45 a. m. to 8 a. m. the batteries are discharging on the line and assisting the generating set to carry the load. This area of the curve is indicated by the double line shading in the diagram.

From 8 a. m. until noon the load on the line undergoes only a slight variation and the generator output is exactly equivalent to the load on the line, and during this interval the batteries are floating on the line. Also during the noon hour the load on the line decreases and the batteries again receive charge.

Now, beginning at about 2 p. m. trouble was encountered in the plant through the generating set developing a hot main bearing. Also, at about the same time, the load on the line began to increase as a result of the increased use of illuminating circuits incident to the darkness brought on by a sudden thunder shower. During this emergency, and on account of the hot bearing, it became necessary to shut down the main generating set and to start up the auxiliary generating set of this plant. The double line shading of this area of the curve shows the storage batteries dis-

charging on the line during this interval. It will also be noted that the storage batteries took the entire load on the line after shutting down the main generating set and until the auxiliary set was put in operation and cut in on the line.

From 6 p. m. until 9 p. m. the load on the line gradually decreases and the storage batteries again receive charge from the auxiliary generating set.

APPLICATION TO THE SUBMARINE ELECTRICAL PLANT

In taking up the application of the practice of floating the storage battery on the line in the submarine electrical plant, it is proper to state that, although the principle and methods of floating are practically identical with those of the commercial plants, yet the prime objects in view are necessarily different, in that one is an expedient of commercial efficiency while the other is military. In other words, in the commercial plants where the storage battery is floated on the line, its use is mainly that of a stand-by agent and as such constitutes a secondary source of power, whereas in the submarine plant the battery function is twofold in that it serves as an auxiliary agent for surface operation, while for submerged work it is immediately resolved into the prime mover or source of motive power.

In order to clearly describe the function and method of floating the storage battery on the line in the submarine electrical plant, a brief outline of the general arrangement of electrical circuits and batteries in this plant is necessary. Thus, for various conveniences in operation, design, economy, etc., the several electrical circuits may, in general, be considered as divided into two separate and distinct power systems as follows:

(a) Main power system.

(b) Auxiliary power system, which also includes the emergency circuits.

In each of the above systems, the normal operating voltages depend upon the manner in which these systems are connected up to the batteries. Thus, for the main power system the maximum operating voltage is equivalent to the terminal voltage of all cells of the entire battery connected in series, whereas that of the auxiliary power system is represented by the terminal voltage of only one-half of the cells of the battery connected in series. In order to obtain this variation in voltage, it is usual to divide the battery into two equal groups, all cells of which are connected in

series, and by interposing suitable series-parallel switches in the line, this arrangement facilitates connecting the main and auxiliary power systems with the battery in such manner as to obtain the desired operating voltages for these systems. Also, the series-parallel switch combination further facilitates connecting the batteries to the dynamo-electric charging sets in such manner as to effectively float the auxiliary load on the line, when cruising under the oil engines.

In Fig. 7 is shown the method of connecting up the reverse-current circuit-breakers R and R' with the series-parallel switch S for floating the storage battery on the line in the submarine electrical plant.

When the submarine is operating on the surface, in normal cruising condition; that is, under the oil engines, the power required for many of the various auxiliaries is supplied by the storage batteries. Hence, in view of the increased size of the modern submarine together with the corresponding increased size and application of motor-driven auxiliaries and other electrical apparatus in these boats, the auxiliary load on the storage batteries has thus been necessarily increased; so that, for a sustained cruise in a modern submarine, the question of the magnitude of the auxiliary load is of paramount importance and constitutes a factor which materially affects the successful operation of the boat and, obviously, counsels the serious consideration and attention of the designers of the boat, her commanding officer, and operating personnel.

Therefore, as a means of relieving the storage battery from a large portion of the auxiliary load, thereby reducing the working of the battery to a minimum with the consequent increase in its life, the principle of floating the battery on the line has been adopted and now constitutes one of the routine engineering practices in the modern submarine electrical plant, and in this capacity has proved most advantageous and successful as a military as well as a commercial expedient.

Furthermore, while operating the submarine in normal surface trim, under the oil engines, it is the usual practice to utilize the main generating sets for floating the auxiliary load on the line, and since the main generating sets are directly driven from the propeller shafts, the oil engines also supply the power for developing the electrical energy required for operating the various motor-driven auxiliaries. Also, inasmuch as the normal operating volt-

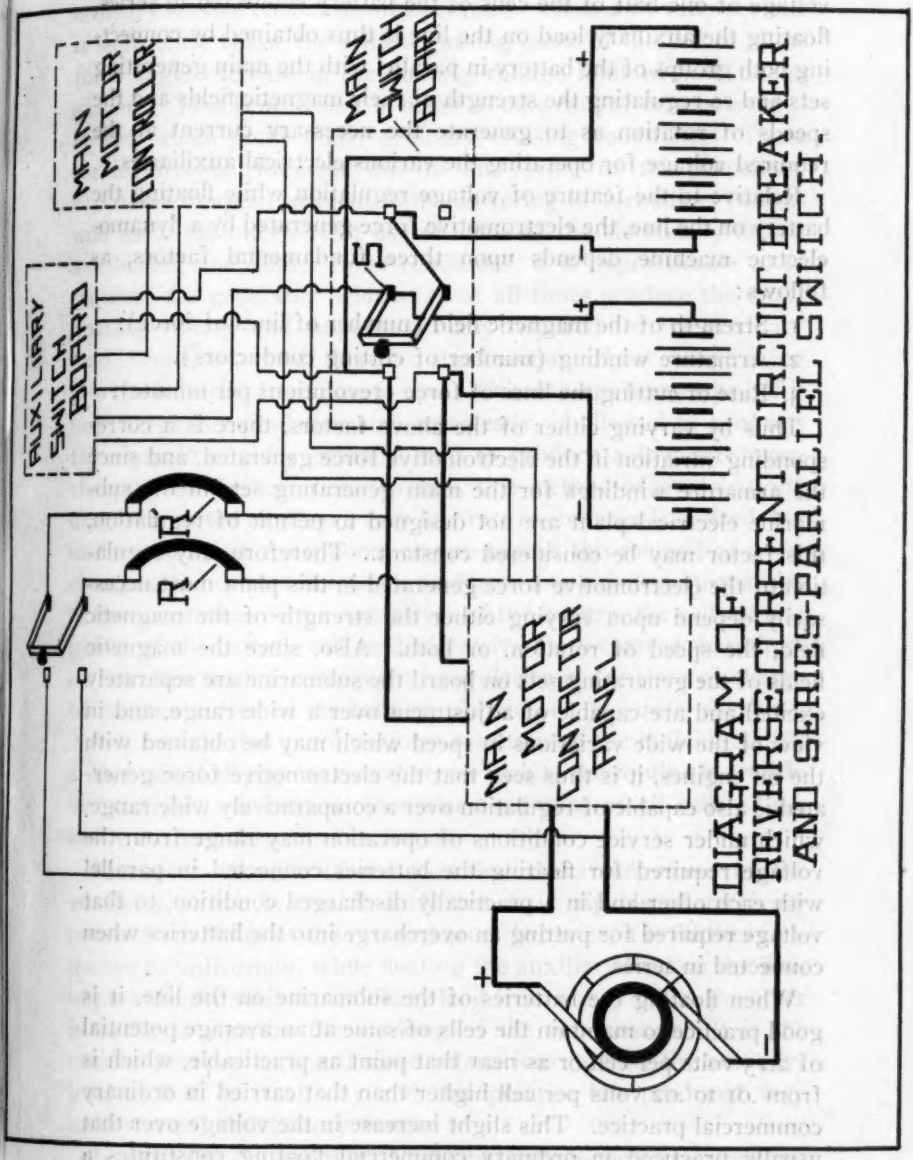


DIAGRAM OF REVERSE-CURRENT CIRCUIT BREAKER AND SERIES-PARALLEL SWITCH.

FIG. 7.

age of the auxiliary power system is based upon the terminal voltage of one-half of the cells of the battery connected in series, floating the auxiliary load on the line is thus obtained by connecting both groups of the battery in parallel with the main generating sets and so regulating the strength of their magnetic fields and the speeds of rotation as to generate the necessary current at the required voltage for operating the various electrical auxiliaries.

Relative to the feature of voltage regulation while floating the battery on the line, the electromotive force generated by a dynamo-electric machine depends upon three fundamental factors, as follows:

1. Strength of the magnetic field (number of lines of force).
2. Armature winding (number of cutting conductors).
3. Rate of cutting the lines of force (revolutions per minute).

Thus by varying either of the above factors, there is a corresponding variation in the electromotive force generated, and since the armature windings for the main generating sets in the submarine electrical plant are not designed to permit of regulation, this factor may be considered constant. Therefore, any regulation of the electromotive force generated in this plant must necessarily depend upon varying either the strength of the magnetic field, the speed of rotation, or both. Also, since the magnetic fields of the generating sets on board the submarine are separately excited and are capable of adjustment over a wide range, and in view of the wide variations in speed which may be obtained with the oil engines, it is thus seen that the electromotive force generated is also capable of regulation over a comparatively wide range, which under service conditions of operation may range from the voltage required for floating the batteries connected in parallel with each other and in a practically discharged condition, to that voltage required for putting an overcharge into the batteries when connected in series

When floating the batteries of the submarine on the line, it is good practice to maintain the cells of same at an average potential of 2.15 volts per cell or as near that point as practicable, which is from .01 to .02 volts per cell higher than that carried in ordinary commercial practice. This slight increase in the voltage over that usually practiced in ordinary commercial floating constitutes a strategic expedient resorted to in the interest of military preparedness in maintaining the battery in a state of as nearly full

charge as is consistent with its proper care and upkeep under ordinary service conditions of operation. Also, 2.15 volts per cell is sufficiently below the critical gassing point of the cell to allow for a slight increase in the floating voltage limit without undue gassing. This is necessary in order to take care of certain irregularities which occur under ordinary cruising conditions. These service irregularities are due to the racing of the propellers, variations in speed incident to maneuvering in formation, etc., as well as to the intermittent use of some of the electrically driven auxiliaries, and, under these conditions, it is impracticable to so regulate the generator fields as to at all times produce the exact floating voltage and amperes actually required for the auxiliary load; hence, as a result there is a small amount of net charge going into the batteries from time to time. Other things being equal, this net charge is cumulative and, manifestly, if allowed to progress far enough would eventually tend to produce a low rate overcharging of the batteries. In fact, this method of overcharging may be resorted to when a very low rate overcharge is desired, but under other than exceptional circumstances, this method of overcharging is not recommended, as due to any existing inequalities in the resistances of the two halves of the battery, the cells of one group of the battery will tend to receive more current than those of the other with a consequent irregularity in the state of charge of the two halves of the battery. Therefore, generally speaking, it may be said that more uniform results with the individual cells will obtain if all regular overcharges, such as the routine bi-weekly overcharges, are carried out under conditions of all cells of the entire battery connected in series.

Moreover, in view of the fact that the arrangement of the auxiliary power system is such that it is capable of receiving power from either of the two groups of batteries, it is further conducive to uniformity, while floating the auxiliary load on the line, to periodically shift the auxiliary load from one group to the other in order to equalize the working of the two groups. It is the routine practice on board some submarines to shift the auxiliary load at 8 a. m. each day and this practice has produced very uniform and satisfactory results.

In regard to the question of liability of the battery to overcharge while floating on the line, it may be said that, since the storage batteries in a submarine receive the constant care and attention of

the operating personnel, there is little likelihood of damage to the battery from this cause, for, provided the specific gravities of the pilot cells correspond with those of the other cells of the battery, or if they do not actually correspond with them, if their errors plus or minus in points of gravity are known, it is then only necessary to keep an accurate and regular check on the pilot cell gravity readings in order to at all times know the state of charge of the battery. Thus, by this routine method, when the pilot cell readings indicate that the batteries have reached a state of charge such that satisfactory floating is not obtained without gassing, the generators may be shut down and floating discontinued entirely and the batteries allowed to take the auxiliary load until such time as the state of discharge again permits of satisfactory floating.

Also, when cruising in a heavy seaway and it is desired to float the batteries on the line, it is especially important when so doing that very close attention be paid to the pilot cell readings. These readings should be taken at 30-minute intervals in order to insure against injury to the battery through excessive gassing brought about by the intermittent high rates of charge incident to the racing of the engines when the propellers lift out of the water. Although the racing of the engines is moderated to a certain degree when floating the battery on the line, yet the increase in the number of revolutions per minute when the propellers lift out of the water is such as to cause a much higher rate of charge to pass into the battery than ordinarily occurs during the normal operation of floating the battery when cruising in a smooth sea, and for this reason, the special precautions against floating at too high a voltage should be taken to guard against injury to the battery from this cause. Therefore, floating should be intermittent when cruising in a heavy seaway; that is, the battery should be floated until the average voltage per cell is 2.15 volts, when the generators should be shut down and the battery discharge on the auxiliary load until such time as the pilot cell readings indicate that the batteries have reached a state of approximately 25 per cent discharge on the three-hour rated ampere-hour capacity basis.

Another very important point incident to the operation of floating the battery on the line, and one which is worthy of the constant attention and consideration of the commanding officer and the operating personnel, is the question of proper ventilation of the boat while floating. As to this feature, the ventilators should be

so operated as to at all times keep the atmosphere of the boat as free as possible from all acid fumes and gases which are evolved from the storage batteries. Also, in so far as is consistent with the demands of the service, floating the battery on the line should be discontinued sufficiently long before sealing the boat for a submerged run as to enable the ventilators to expel all battery gases and fumes before ventilating in-board. Manifestly, under conditions of war-time operation, a dive may frequently have to be made with very little warning beforehand, yet the training of the crews and development of the organization on board the submarine should be such as to anticipate a dive as far in advance of the actual sealing-up of the boat as is possible. This procedure is entirely essential to the efficient and successful operation of the boat.

Chief among the many advantages obtained as a result of floating the storage batteries on the line in the submarine electrical plant may be included the following:

I. Conservation of man-power. This through requiring no additional duty at watch-standing for charging the batteries upon arrival in port. Only an old submarine man, who has actually experienced the gruelling grind of a strenuous submarine trip at sea and upon arrival in port has had to remain on duty for five or six hours for charging the batteries, can fully appreciate this advantage. Upon arrival in port and when coming alongside, the chief electrician's cheery report—"Full battery, sir!" is a welcome sound to the entire crew, as it betokens a hot bath, clean clothes, fresh food, and "all night in" for all hands.

II. Conservation of battery power. Over a given period of operation, fewer complete cycles required of the battery; hence increased life of the battery. Also, the battery is kept in a healthy condition, its pores kept open, and effects of sulphation and local action reduced to a minimum.

III. Conservation of engine power. Under ordinary cruising speeds there is a material surplus of engine power available which may well be used for carrying the auxiliary load while the battery is floated on the line. Hence, for a given period of operation, a reduction is effected in the number of hours the engines are actually in operation, with the consequent increased economy in the fuel oil and lubricating oil consumption.

IV. Battery works at greater efficiency. Over a given period of operation, due to the practically full-charged condition of the

battery, the average voltages during discharge are higher; hence, an increase in the number of kilowatt hours developed for this period.

V. Maximum amount of reserve maneuvering power available in event of disability of engines. This is an especially important advantage, since the reserve power gained thereby would be invaluable in effecting an escape should engines become disabled in the presence of the enemy. Likewise, in event of such disability during a heavy storm at sea, it would materially assist in maintaining steerage way in riding out a gale or even the possibility of reaching port or sheltered waters through the aid of the motors.

Furthermore, if operating in extremely cold weather and disabled at sea, the battery power is available for cooking purposes as well as heating the boat and preserving the health and comfort of the crew for a considerable length of time.

VI. Acts as a balance for the main engines and thus reduces the wear and tear on parts by assisting in preventing racing of the propellers when cruising in a sea-way.

VII. Under exceptional circumstances it may be used for a long, low-rate overcharging of the batteries.

Finally, in summing up the foregoing advantages, it is, in a word, an increase in the submarine's total plant efficiency, both matériel and personnel.

Therefore, since in light of present-day development of the submarine, the storage battery is the accepted source of motive power for submerged maneuvers and operations, it is highly essential from a point of military efficiency that the batteries be maintained in such conditions as to enable the submarine to effectively perform its paramount duty—that of submerged approach and attack. Moreover, for a given space and weight, since the high-rate energy output of the storage battery or its capacity for driving the boat through the water at sustained high speed is comparatively limited at best, it is thus necessary, while operating on the surface, that the batteries be kept in a state of practically full charge and in a condition for developing a maximum amount of energy on comparatively short notice in order that the successful submerged approach and attack may be consummated. This condition obtains, in a measure, through the practice of floating the storage batteries on the line, and, obviously, for successful war-time operations, the desirability of such an expedient is apparent.

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE TYPE *V* AZIMUTH CIRCLE

By LIEUTENANT H. R. GREENLEE, U. S. Navy

The advent of the gyro-compass with its pelorus repeaters, made necessary the design of an instrument for use with the repeaters, that would fulfill all conditions to be met. The U. S. Naval Observatory courteously authorized the writer to make alterations to two Type III azimuth circles and the Type *V* is the result. The writer worked with the two altered circles under all conditions of weather for several months and found no condition not met.

The circle was designed, primarily, for use in connection with the gyro-compass, but may be efficiently used with the magnetic compass; however, it is considered better practice to take all observations with the gyro repeater and obtain magnetic compass errors by comparative readings of the ship's head. When used on a gyro-compass repeater, at night, no illumination is required other than that supplied by the gyro repeater itself, but when used on a magnetic compass at night, some arrangement must be made for illuminating the compass card, unless the Mark VII binnacle is installed which has the compass card illuminated.

The repeater on which the instrument is used should have a double row of degree figures, one row erect and the other row inverted. The inverted row is for use when using the mirror for reflecting the degree graduations to the eye, and the other row for direct readings. The two rows of figures may cause slight confusion at first, but that will wear off in a very few days.

The features sought and accomplished in the design of the instrument are as follows:

(a) Ease of setting to any desired angle from the ship's head.
(b) Ease of use in the daytime on near-by objects.
(c) Ease of use in the daytime on distant objects.
(d) Ease of use in the night-time.
(e) Ease of use in rainy weather.
(f) Ease of use in the daytime for sun bearings.
(g) Ease of use in the night-time for star bearings.
(h) Ease in adjusting on board ship.

The details of the Type *V* circle are shown in the illustrations, but a brief description will be given of how the instrument is constructed and how each object is attained.

The circle is manufactured with the horizontal wire in the cross-plate accurately centered and so that it can be renewed without disturbing the adjustment. The adjustment of all elements are referred to this wire.

(a) Ease of setting the instrument to any desired angle from the ship's head is accomplished by cutting away the circle on the front side in such a way the graduated bezel ring can be seen and angle figures on it easily read by looking between the front plane mirror and the front vane. (This is not possible as the circle is now being manufactured.)

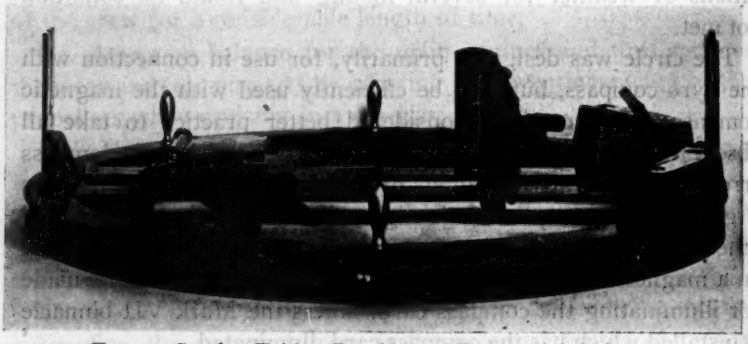


FIG. 1.—Set for Taking Bearings of Terrestrial Objects.

(b) The ease of use in the daytime on near-by objects is accomplished by fitting the front vane with a point and the rear vane with a *V* for sighting over. The vertical wire in the front vane and the slit in the rear vane are fitted but will probably seldom be used. The front plane mirror is fitted partly to reflect the image of the repeater card to the eye. The telescope is fitted primarily for use on distant objects, the bearing being read direct by the horizontal wire, but experience has proved its value and desirability for near-by work, except in wet weather.

(c) Ease of use in the daytime on distant objects is accomplished by means of the telescope, which was designed to be quickly attached to or detached from the circle and if used with care two dowel pins on the mount setting into the cross-plate will insure against adjustment error. (As the circle is now being manu-

factured, the thumb screw for securing the telescope to the cross-plate is cumbersome and easily lost and should be replaced by a simple, quicker and non-losable arrangement.)

(d) Ease of use in the night-time is achieved by mounting a point of radium salts on the front and the rear vanes and as the radium salts are luminous at night these points make two or the three points in the line of sight. The repeater should be dimmed to prevent the blinding of the eye by the light reflected to it by the front plane mirror. (On the circle now being issued the front point of radium salts is too small.)

(e) For use in rainy weather, the front plane mirror is fitted in lieu of a prism, for, by throwing up the mirror to the vertical position and smearing the moisture with the thumb, and throwing

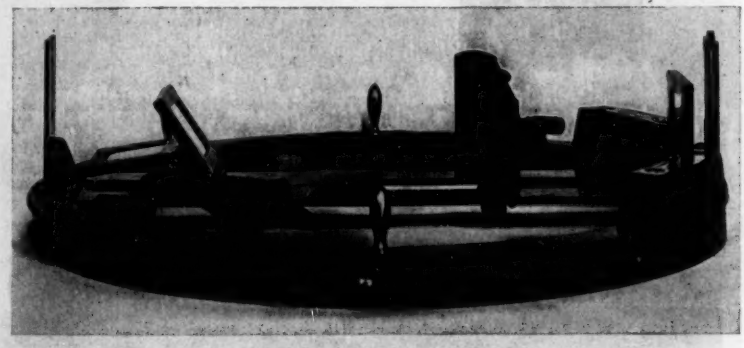


FIG. 2.—Set for Taking Bearings of Celestial Objects.

down to position, it can be efficiently used without eye-strain and there will be no distortion.

(f) In taking bearings of the sun, the curved mirror and prism used on the Type III circle are fitted at 45° from the cross-plate for the use of those who desire to use that method. For those who prefer the other method, a curved mirror is mounted on the rear of the cross-plate of the instrument and a white line is marked on the center of upper part of the front mirror frame on which to split the pencil of light. For leveling purposes a level is mounted on the under side of the cross-plate.

(g) To take star bearings, a plane mirror is mounted on the rear of the cross-plate of the instrument for reflecting the image of the star to the front mirror, which reflects the image back to the eye. The image of the star is centered in the front mirror by means of a point of radium salt in the center of the upper part of

the front mirror frame. The instrument is leveled by using the level under the cross-plate which has the level case so cut away that the bubble can easily be seen by means of the light coming up through the translucent repeater card.

(h) The instrument is capable of complete adjustment in the chart-house except for that part used for taking sun bearings, which was taken from the Type III circle. The adjustment feature is a distinct advantage; for, with the Type III circle, a navigator never knew for sure how much error was in his circle.

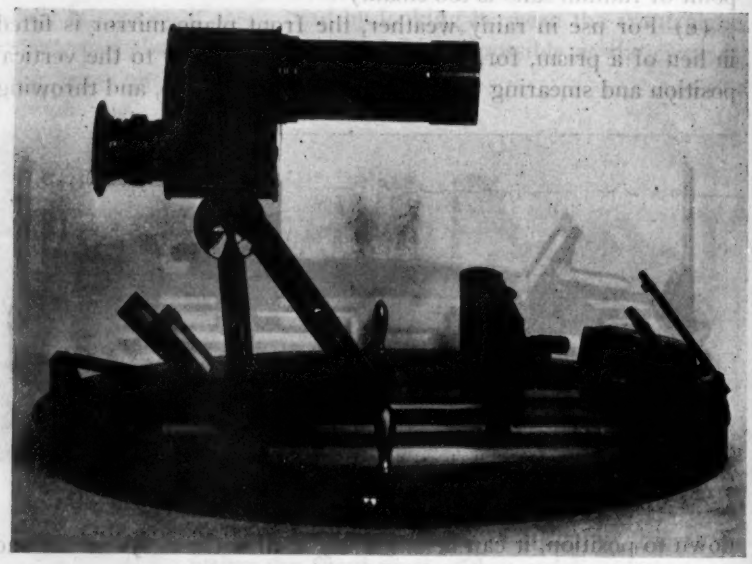


FIG. 3.—Set for Use with Telescope.

As was stated before, the circle is manufactured with the horizontal cross-wire accurately centered and the adjustment of all parts is referred to as follows:

Rear Vane.—Throw down the vane and adjust it so that the *V* is exactly vertical to the horizontal wire in the cross-plate and then place the eye vertically over the slit and *V*. Swing the vane slowly up and if the relative position of the horizontal wire in the cross-plate and the *V* and slit in the vane remain unchanged, the vane is adjusted correctly.

Front Vane.—The front vane may now be adjusted in a similar manner to the rear vane.

Front Plane Mirror.—Set the mirror bracket so that when the mirror is thrown up to a vertical position the white lines on the mirror frame coincide with the horizontal wire in the cross-plate. Place the eye at the rear vane and throw the mirror so as to reflect the horizontal wire in the cross-plate to the eye and give it the maximum swing obtainable back and forth by which it will reflect to the eye the horizontal wire or the rear vane. If the

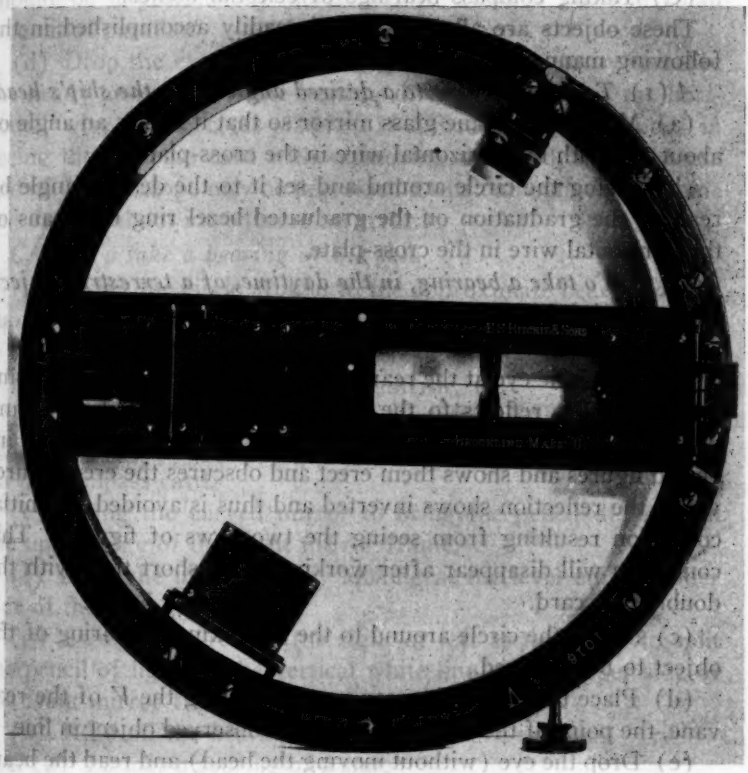


FIG. 4.—Plan View.

reflected images remain vertical and coincident with the lines on the mirror frame, the mirror is in adjustment.

Rear Mirrors.—Adjust in a similar manner to the front mirror.

Telescope Attachment.—Sight the vanes of the circle on some object on the ship as the flag staff and if the vertical wire of the telescope coincides with this object, the telescope is in adjustment.

The curved glass mirror and prism that are mounted 45° from

the horizontal wire in the cross-plate, may be adjusted by making comparative observations of the sun with it and the element mounted on the cross-plate.

The uses of an azimuth on board ship are limited to the following objects:

(A) Setting to any angle relative to the head of the ship.

(B) Taking compass bearings of terrestrial objects.

(C) Taking compass bearings of celestial bodies.

These objects are all quickly and readily accomplished in the following manner:

A (1) *To set the circle to a desired angle from the ship's head.*

(a) Move front plane glass mirror so that it makes an angle of about 45° with the horizontal wire in the cross-plate.

(b) Swing the circle around and set it to the desired angle by reading the graduation on the graduated bezel ring by means of the horizontal wire in the cross-plate.

B (1) *To take a bearing, in the daytime, of a terrestrial object, using the sighting vanes.*

(a) Throw down the rear curved and plane mirror.

(b) Place the eye at the rear vane and swing up the front plane mirror until it reflects to the eye the outer row of figures and degree graduations on the compass card. (This reflects the inverted figures and shows them erect and obscures the erect figures which the reflection shows inverted and thus is avoided the initial confusion resulting from seeing the two rows of figures. This confusion will disappear after working for a short time with the double-row card.

(c) Swing the circle around to the approximate bearing of the object to be observed.

(d) Place the eye at the rear vane and bring the *V* of the rear vane, the point of the front vane and the observed object in line.

(e) Drop the eye (without moving the head) and read the bearing as reflected by the front plane mirror.

B (2) *To take a bearing, in the night-time, of a terrestrial object, using the sighting vanes.*

Bearings at night will be taken in a manner similar to that employed in the daytime except that the points of light on the vanes will be used instead of the point and *V*. The reflector, however, should be dimmed so as not to blind the eye.

B (3) *To take a bearing of a distant object with the telescope attachment.*

(a) Throw down the rear vane.

(b) Swing the circle around to the general direction of object to be observed (a little practice will make it possible to always bring the object within the field of the telescope without delay or inconvenience).

(c) Bring the observed object and the vertical wire in the telescope into coincidence. The horizontal wire in the telescope should be approximately horizontal to avoid a possible small amount of parallax.

(d) Drop the eye quickly (it should not be necessary to move the head) and read off the bearing direct by means of the horizontal wire in the cross-plate. (If difficulty is experienced in seeing the compass card without moving the head, the eye lense end of the telescope may be depressed a small amount to overcome this fault without introducing an error.)

C (1) *To take a bearing of the sun.*

(a) Swing the circle around to the approximate bearing of the sun.

(b) Place the eye at the *V* in the rear vane.

(c) Throw down the rear plane mirror.

(d) Throw up the front plane mirror until it shows the reflected image of the graduations and the outer row of figures on the compass card.

(e) Swing the curved mirror to bring the pencil of light on the upper edge of the front mirror frame.

(f) Level the instrument by looking at the level on the under side of the cross-plate.

(g) Swing the circle to the right or left as necessary to split the pencil of light on the vertical white line on the upper side of the front mirror frame.

(h) Read off the bearing by the front plane mirror.

C (2) *To take a bearing of a star.*

(a) Throw the curved mirror well back out of the way and throw the rear plane mirror down.

(b) Dim the repeater.

(c) Swing the circle around to the approximate bearing of the star to be observed.

(d) Place the eye at the *V* of the rear vane.

(e) Throw up the front plane mirror until the plane of the mirror is perpendicular to the line of sight.

(f) Swing the rear plane mirror slowly up until the image of the star is seen in the front plane mirror and near the upper edge of it.

(g) Drop the eye to the level on the under side of the cross-plate and level the instrument.

(h) Swing the circle to the right or left as necessary to bring the star image directly under the point of luminous radium salts located on the upper side of the front mirror frame.

(i) Drop the eye to the compass card and read the bearing of the star directly from the card by means of the horizontal wire in the cross-plate.

In connection with the above description of the Type *V* azimuth circle, attention is particularly invited to that part of it which is designed for use in taking star bearings. Many navigators do not feel the need of star bearings for compass error, but the ability to get them has on several occasions contributed considerable to the writer's peace of mind; once, when making the unlighted entrance to a narrow channel before sun up and on other occasions when it was suspected that the gyro-compass was oscillating. The compass error by the star bearing attachment is considerably simplified when azimuths can be obtained of Polaris and thence the compass error without the use of the time or tables.

It might be said in closing, that, on the *Montana,* the writer obtained and installed water-tight seven point plugs and receptacles in the electric leads from the connection boxes to the repeaters for the purpose that, should the gyro repeater fail on the gyro-compass itself, the repeaters could be quickly detached, removed and the peloruses installed in the stands for use, instead of trying to work a repeater as a dumb compass.

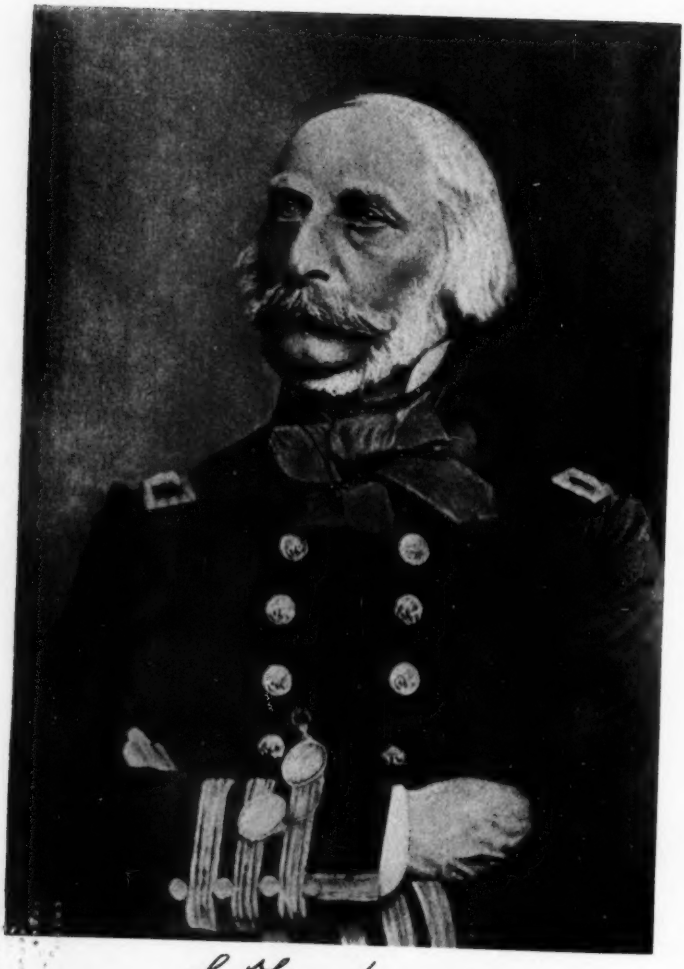
Note by the Writer.—The Type *V* azimuth circle now being issued to the service is not correct in manufacture, but it is hoped that corrections will be made. The defects are—

(a) The front plane mirror is too close to the front vane, thus precluding the seeing of the graduated bezel ring and the degree figures when looking between the mirror and the front vane.

(b) The center of weight of the telescope and mount is not perpendicular to the center of the instrument, thus necessitating the use of counter weights.

(c) The thumb screw for securing the telescope to the instrument is cumbersome and easily lost. The attachment arrangement should be simple and parts non-losable.

(d) The radium spot on the front vane is too small.



C. H. Davis

[COPYRIGHTED]

U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE NAVY AND FILIBUSTERING IN THE FIFTIES

(CONTINUED)

By LOUIS N. FEIPEL

IV. WALKER'S SURRENDER TO DAVIS IN 1857

While the foregoing events were taking place in and around Greytown, the republic of Nicaragua was being rent by revolution. Two rival parties, the Legitimists and the Democrats, were contending vigorously for the sovereignty. Neither party was strong enough to overcome the other, or permanently to maintain internal tranquillity. But in the midst of this political debility, and at a time when both parties were about exhausted, one of them (the Democrats), late in the year 1854, accepted the proffered assistance of a band of American adventurers, from California, under the leadership of one William Walker.

The resentment that had developed in the minds of the American people as a result of Great Britain's occupation of Central American territory was not without its effect upon the attitude of large numbers of Americans toward the entrance of Walker into Nicaragua. And when he contemplated entering the country, the action of Great Britain was still fresh in men's minds, and any movement tending to check her pretensions on the Isthmus was sure to meet with some favor in all parts of the United States.

From the leader of the Democrats, Walker had obtained a contract to bring to Nicaragua 300 Americans, who were each to receive several hundred acres of land, and who were described as "colonists liable to military duty." This contract Walker submitted to the Federal authorities in San Francisco, who saw nothing in it that would warrant them in interfering. But the "colonists" themselves undoubtedly knew that they were enlisting in an enterprise that was clearly in violation of the neutrality laws of the United States.

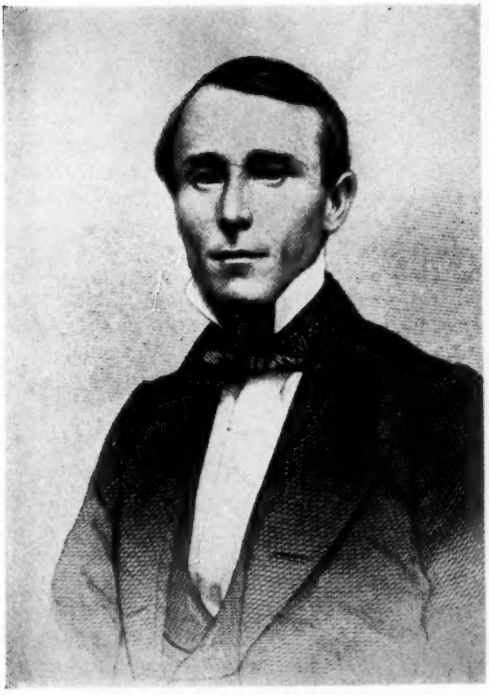
In June, 1855, Walker and his band, on board the brig *Vesta*, arrived at Realejo, on the west coast of Nicaragua. There he was met by representatives of the Provisional Director of the Democrats, and warmly welcomed. The upshot of his activities

was, that in June, 1856, he was elected President of Nicaragua. But in this success the neighboring republics saw a menace of their own independence, and soon Costa Rica, Guatemala, Salvador, Honduras, and the malcontents of Nicaragua, declared war against him. Fortune for a while favored Walker, but finally, through the machinations of the financiers who controlled the Accessory Transit Company, and who were inimical to Walker, he was forced to make a last stand in his capital, Rivas.

Shortly after Walker's entrance into Nicaragua, in 1855, orders were issued for some of our warships to visit the Atlantic and Pacific coasts of the republic. They were instructed to look to and protect the persons and property of our citizens, but at the same time, in order that there might be no misapprehensions as to the extent to which they had a right to interfere, their commanders were informed that they had no right, except in very extraordinary cases, to send forces to operate on land, and in no case were they permitted to take any part in the conflicts of the contending parties within the limits of the country. They could and should, however, protect our merchant vessels from illegal seizure and pillage, and afford an asylum to our citizens who wished to escape from scenes of violence and bloodshed, and secure a depository for their property. "Acts of war cannot be committed without the authority of Congress. Repelling threatened outrage upon our citizens, or shielding their property from unjust seizure, or protecting their persons, are not acts of war. They are exertions of power not inconsistent with the relations of peace."[1]

Early in November, 1855, the steam frigate *Massachusetts,* Lieutenant Commanding S. Swartwout, arrived at San Juan del Sur, on the Pacific side of Nicaragua. In December, Lieutenant Swartwout visited Granada, the capital of Nicaragua, for the purpose of inquiring after some of his men who had deserted from the *Massachusetts,* as well as for certain deserters from an American merchant ship lying at San Juan del Sur. Some of these deserters had found their way into Walker's army, yet they were all promptly given up on demand. On this occasion, it is said, Lieutenant Swartwout and three of his officers remained three days in Granada, fraternizing with the filibusters. This, together

[1] Secretary of State Marcy to John H. Wheeler, Chargé d'Affaires in Nicaragua, November 8, 1855. See Senate Exec. Doc. No. 68, 34th Cong., 1st Sess.



General William Walker.

with the unauthorized recognition of the Walker-Rivas government by our minister, Wheeler, only served to increase the impudence and confidence of the filibusters.

The orders to Commodore Hiram Paulding, who had assumed command of the Home Squadron in 1855, were likewise quite explicit. Under date of November 16, 1855, the Secretary of the Navy instructed him as follows:

> The course of events occurring for a few years past, and the regular transit of a number of American citizens across the Isthmus to and from the Pacific and Atlantic States, constitute of themselves a sufficient reason for at least an annual visit of a national vessel [to Central American ports]. But recent events seem especially to demand the presence of a part of the Home Squadron, and of an officer whose mature judgment and experience may guide him to proper action under the circumstances which inquiry may develop, and whose commanding position may exert influence and inspire respect. I therefore desire that you, as commander-in-chief of the squadron, should immediately proceed with the flagship, the *Potomac*, to San Juan del Norte [Greytown]. Intelligence has reached your government that citizens of the United States who were passengers on the steamers of the Transit Company have been killed, and others wounded and otherwise maltreated. It is said that they were merely availing themselves of the usual facilities for travelling from one portion of their country to another, and were not engaging in or encouraging the revolutionary movements distracting the people of Nicaragua.[1]

These orders were supplemented, in December, as follows:

> NAVY DEPARTMENT, December 11, 1855.
>
> SIR: The condition of affairs in Nicaragua, instead of assuming the appearance incident to a stable and well-regulated government cheerfully acquiesced in by the people, threatens to become more complicated. Although the instructions already given may be entirely sufficient, it is considered prudent to put you in possession of more recent intelligence, and to advise you distinctly of the relations of your government to the authorities claiming to be in the lawful exercise of the functions of government of that state.
>
> Mr. Wheeler, the U. S. minister to Nicaragua, had been instructed not to recognize or have official intercourse with Mr. Walker, or those who favor his revolutionary proceedings and claim to administer the affairs of that republic. Previous, however, to receiving those instructions, our minister had pursued a different course. I send you a copy of the latest instructions to him, in order that you may distinctly understand the views of your government. The President has called my attention to the following extract from Mr. Wheeler's despatch of the 12th ulto.:
>
> "I hope that soon a ship of war will be at San Juan del Norte. In which event, as I learn from good authority, the present government of Nicaragua will assert its rights to the town and port of San Juan del Norte

[1] *Ibid.*

by taking possession and hauling down the Mosquito flag and raising their own, it may be proper to give instructions to the commander of any United States ship that may visit that port, since it is said and believed that this occupation by Nicaragua will be opposed by the English naval force, which is always present in that harbor."

It is inferred from this statement that Mr. Wheeler is regulating his movements in regard to San Juan del Norte with the hope of receiving countenance and assistance from the naval force of the United States. It is not, however, inferred that the opinion is entertained that the British naval force will take possession of San Juan for the purpose of occupying or colonizing it, or retaining it at all, but that they may possibly interfere simply to carry out the views of the British Government in the exercise of a protectorate over the Mosquito territory, so far as to prevent any force from "hauling down" the Mosquito flag, and no farther. If that be the case, then I am directed by the President to instruct you to confine any interference on your part exclusively to the protection of American citizens. It is proper that I should add that official correspondence with the British Government confirms the President in the opinion that there is no intention on their part to take possession of San Juan.

You have already been advised that your government differs essentially from the government of Great Britain in its interpretation of the treaty of 1850, and that the President will not recede from or abandon his construction of it. It is proper, however, that I should inform you that the questions arising under the treaty are now the subject of investigation, and that the hope of satisfactory adjustment has not as yet been entirely abandoned.

The instructions from the Secretary of State to Mr. Wheeler will inform you of the views of your government toward Mr. Walker and the present unstable government in Nicaragua, as yet unsanctioned by the people.

I am directed by the President to advise you that it is not expected of you to afford aid or countenance to any force which may attempt to seize San Juan del Norte under the party now assuming to be in power in Nicaragua. You will, however, afford protection to American citizens if there be any in that region who have not abandoned their own country and forfeited claims to protection.

I am not aware of any necessity whatever for detaining the *Fulton*, which bears you these despatches. You will, however, exercise your judgment. I am informed that the machinery is by no means strong, and that it would not be safe to tax her severely.

I am respectfully,
Your obedient servant,
J. C. DOBBIN.

COMMODORE HIRAM PAULDING,
Commanding Home Squadron,
SAN JUAN DEL NORTE, NICARAGUA.[3]

[3] Meade, "Life of Paulding," 180-2. The instructions to Wheeler referred to in the above are dated November 8 and December 7, 1855, and are to be found in Sen. Exec. Doc. No. 68, 34th Cong., 1st Sess. An extract from the earlier one is cited above (p. 1528).

The *Potomac* arrived at Greytown on December 21, 1855. On the following day, Paulding dispatched his fleet surgeon, Thomas Dillard, to visit Minister Wheeler at Granada, with dispatches requesting the facts in connection with the outrages referred to in his instructions. At Paulding's request, also, Wheeler visited Greytown and conferred with Paulding relative to various matters, one of which was the shooting of a sailor of the *Potomac,* at Castillo. While Wheeler was on board the *Potomac,* Commodore Ogle, of the British sloop-of-war *Arab,* called on him, and during the conversation he said that he would be happy to see Wheeler on board his ship "as a private individual, but not as minister of the United States," as he could not extend the salute due to Wheeler, since he [Wheeler] was not then in the country to which he was accredited, namely, Nicaragua. Of course, the invitation was declined. This incident is somewhat significant as to the feelings of the English regarding Greytown at this time.

Paulding's letter to Wheeler, about the shooting of one of the *Potomac's* men at Castillo, is likewise significant of the attitude of Paulding toward Walker at this time, especially so in the light of subsequent developments. Paulding wrote:

> The character of General Walker is a sufficient guarantee that such conduct will not escape its merited chastisement, and having brought it to his notice I am quite satisfied to leave the matter in his hands. Be pleased to express to the general my profound acknowledgments, and my best wishes for his success in giving to Central America security and repose.[4]

On December 28, Captain Hornsby, second in command to General Walker, waited upon Paulding "unofficially" on board the *Potomac.* He said, after Paulding had given him a friendly greeting, that he had come on the part of Walker to invite Paulding to Granada. This, with a civil message to the general, Paulding declined. Hornsby remained on board an hour or more, recounting some of the extraordinary adventures of the filibusters. He also spoke of Greytown, and indicated a purpose of taking it and hauling down the Mosquito flag, making some allusion, at the same time, to the British warships lying in the harbor.[5] Paulding advised Hornsby not to land in Greytown, saying the time had not arrived for them to resist the British protectorate of the Mosquito territory. During the week following, several

[4] Sen. Exec. Doc. No. 68, 34th Cong., 1st Sess.

[5] The governor of Greytown, it should be remembered, still considered himself under the protectorate of Great Britain.

visitors to the ship gave conflicting accounts of the conditions prevailing, but all of them apparently were anxious to stand well with the commodore. On January 7, 1856, the squadron proceeded to Havana, and there Paulding succeeded in allaying the fears of the authorities in regard to another rumored invasion of the island by filibusters from the United States.[6]

About a month later, namely, on the 18th of February, the Rivas-Walker government issued a decree revoking and annulling the charter and acts of incorporation of the Accessory Transit Company, and directing "all the property of said company to be seized." In obedience to this decree, all the property of the company on the Isthmus was seized. Its value was between $700,000 and $1,000,000. The interoceanic communication by way of Nicaragua was thus effectually interrupted, and the persons and property of unoffending private citizens of the United States in that country again became jeopardized. Through its president, Cornelius Vanderbilt, the company, on March 26, requested the interposition of the United States Government, to wrest from the aggressors their plunder, and to restore the company to the enjoyment of its outraged rights.[7]

By the middle of September, 1856, the British had stationed off Greytown a strong fleet, consisting of eight vessels, carrying several hundred guns, and evidently with a view to influencing the result of the war in Nicaragua. No United States vessels, however, were sent thither to watch the movements or to ascertain the intentions of the British fleet.[8]

On the 1st of November, the President of Costa Rica issued a decree, declaring, in its second article: "The navigation of the river San Juan del Norte is prohibited to all kinds of vessels while hostilities against the invaders of the Central American soil con-

[6] Meade, "Life of Paulding," 146-50.

[7] On March 24, 1856, the Senate passed a resolution, supplemented on May 8 by a similar measure in the House, calling on the President to transmit to Congress the reports of the Secretary of State, the Secretary of the Navy, the Secretary of the Treasury, and the Attorney General, with reference to the routes of transit between the Atlantic and Pacific oceans through the republics of New Granada and Nicaragua, and to the condition of affairs in Central America. These documents were duly transmitted by the President on May 15, and were printed as Senate Executive Document No. 68, 34th Congress, 1st Session.

[8] Walker, "The War in Nicaragua," 352-3.

tinue." And the fourth article declared: "The officers and military forces of the republic will carry out this decree, using for that purpose every means within their reach." This was, in fact, a public and explicit declaration to the United States that if they desired to keep the Transit from being closed during the hostilities between Nicaragua and Costa Rica, they must station United States warships at Greytown to resist force with force. But no warships were sent, and the decree was carried out. Moreover, the United States Government does not appear to have taken any steps to re-establish the Transit, or to protect the filibusters who were aiming to re-open it, from interference by the British naval forces.[9]

It was in December that the Costa Ricans, under the command of one Spencer, took possession of the river steamers at Punta Arenas. There being no American war-vessel near, the United States commercial agent at Greytown called on Captain Erskine, of the British warship *Orion,* to protect American interests from the soldiers of Costa Rica. To this request Captain Erskine replied that he had taken steps, by landing a party of marines, to protect the persons and private property of all citizens of the United States; but with regard to the capture of the steamers, he added:

> To prevent all misapprehension, I think it, however, right to state that the steamers and other property belonging to the Accessory Transit Company being at this moment the subject of a dispute between two different companies, the representatives of which are on the spot, and one of them authorizing the seizure, I do not feel justified in taking any steps which may affect the interests of either party. With respect to the participation of a force of Costa Ricans in the seizure and transfer of the steamers alluded to, I must observe that these steamers having been for some months past employed in embarking in this port, and conveying to the parties with whom Costa Rica is now carrying on active hostilities, men and munitions of war, it appears that as a non-belligerent I am prohibited by the law of nations from preventing the execution of such operations by a belligerent party.[10]

A man named Lockridge was then appointed by the Nicaraguan Transit Company's agent to clear the San Juan River of the Costa Ricans. Lockridge remained for some days at Punta Arenas, engaged in fitting up one of the old disused river steamers for purposes of transportation. But he was not allowed to work without interruption by the British naval officers. On the morn-

[9] *Ibid.*, 353-4.
[10] *Ibid.*, 345.

ing of the 16th of January, 1857, Captain Cockburn, of the British ship *Cossack,* went ashore at Punta Arenas and inquired for the commander of the armed men occupying the Point. On meeting Lockridge, Captain Cockburn informed him that he had received orders from Captain Erskine, of the *Orion,* to offer protection to any British subjects who might be detained and compelled to bear arms against their will. In accordance with these instructions, Captain Cockburn demanded a list of all the men at Punta Arenas, and required them to be paraded in his presence, that he might read to them the orders of Captain Erskine. The men were accordingly drawn up on the beach, and Cockburn read to them the order of Erskine. The concluding sentences of the order were:

> Should any of the party in question claim protection as British subjects, and their claims appear to you to be well founded, you will acquaint the officer commanding, that these men must be permitted to withdraw from their present position; and you will (in the event of his acquiescence) either give these men a passage to Greytown, or take them on board Her Majesty's ship under your command, to await my decision as to their disposal, as they may desire. In the event of the aforesaid officer resisting such a course as I have pointed out, you will inform him that, in the first place, no person whatever under his command will be permitted to leave their present position, to proceed up the river or elsewhere, until my demands shall be complied with; and, secondly, that I will adopt such measures to enforce the rights of British subjects as I may think best adapted to the purpose.

Ten of Lockridge's men claimed and received protection under this order of Erskine, and were taken from the Point in Cockburn's boat.

Walker's comment on this proceeding is as follows:

> The instructions of Her Majesty's Government must have been indeed stringent, when they induced honorable officers to degrade themselves to the work of inciting men to desert a cause they had voluntarily embraced; for Cockburn, not satisfied with reading Erskine's orders, had also advised the whole of Lockridge's command of the dangers they ran in attacking the large force the Costa Ricans had concentrated on the river.[11]

On the 6th of February, the American sloop-of-war *St. Mary's,* Commander Charles H. Davis, arrived at San Juan del Sur, on the Pacific side. Promptly in her wake came the British war-steamer *Esk,* Captain Sir Robert McClure. The day after his arrival, Sir Robert sent a boat's crew on board a small schooner lying near the shore, to ask the meaning of the ensign which she

[11] *Ibid.,* 356-7.

was flying at the masthead. It was a handsome flag, composed of three horizontal stripes—blue, white, and blue. In the middle stripe, which was twice the width of either of the outer ones, was a five-pointed red star. The ensign was that of the new filibuster republic of Nicaragua, and the vessel, as her commander—one Fayssoux—politely replied, was no other than the Nicaraguan schooner-of-war *Granada.*[12] Sir Robert then ordered Fayssoux to come on board the *Esk,* and to bring his commission with him; to which the plucky Missourian replied that he would do nothing of the kind. And when the English captain threatened a broadside, the Nicaraguan commander beat to quarters—he had a score of men—loaded his two 6-pound carronades, and awaited destruction as calmly as if he had had the deck of a 74 under his feet. But Sir Robert, either fearing to exceed his authority, or laboring under the delusion that Commander Davis, of the *St. Mary's,* might not relish the idea of seeing his fellow countrymen annihilated before his eyes, softened the demand into a request for a friendly visit, which Fayssoux thereupon paid him.

When Sir Robert went to Rivas, some days afterwards, to demand an explanation of Fayssoux's conduct, he was met by Walker with the stern inquiry: "I presume, sir, you have come to apologize for the outrage offered to my flag and the commander of the Nicaraguan schooner-of-war *Granada.*" And the gallant sailor is said actually to have forgotten his wrath in his wonder, and to have made a suitable apology to the wounded dignity of the chief of a thousand men and one schooner. "If they had [had] another schooner," said he, "I believe they would have declared war on Great Britain."[13]

[12] Walker, having confiscated the Nicaraguan schooner *San Jose* for carrying a false register, had had her fitted out with some guns, and had placed her under the command of Fayssoux, renaming her the *Granada.* Fayssoux, the only commander in the navy of Walker's ephemeral republic, was a splendid specimen of the sailor-filibuster. A native of Missouri, he had seen service in the Texan Navy, as well as in Cuba with Lopez and Pickett. The first exploit of the *Granada* was an engagement with the Costa Rican brig *Once de Abril,* carrying three times the armament and six times the crew of the *Granada.* The Costa Rican vessel was blown out of the water after a two-hour fight, and the *Granada* remained mistress of the Pacific Central American waters until the arrival of the *St. Mary's.*—Roche, "Story of the Filibusters," 116, and Walker, "The War in Nicaragua," 233 ff.

[13] Roche, 138; Walker, 385-6.

On the 19th, the *Esk* left for Punta Arenas. Commander Davis, meanwhile, had paid the *Granada* an official visit, and soon sent word to Walker that he wished to visit Rivas on business. Walker promptly ordered an escort to conduct him to the town, and on the 18th he arrived at headquarters. He spent the afternoon and night in Rivas, and in his conversations with Walker studiously addressed him as President. During his stay, the officers who accompanied Davis passed freely through the camp. Davis stated to Walker that the captain of the *Narragansett*, a coal ship at San Juan, would require her small boats (then in Walker's possession), before going to sea. These boats had been brought from the Transit some weeks previously, with a view to using them to regain possession of the lost river steamers; but as they were now useless for this service, Walker told Davis he did not object to returning them to the *Narragansett*. At the same time, Walker mentioned to Davis that the lake and river steamers, belonging to the American owners of the ocean steamships between Nicaragua and the United States, were precisely analogous to the boats of the *Narragansett*, and having asked for the latter, it was only right that Davis should also demand the former from the Costa Ricans. The Transit Company, he said, could no more carry on their business of transporting passengers between the Atlantic and Pacific ports of the United States without the property then in the hands of the Central American allies, than the *Narragansett* could go to sea without her small boats. Davis appeared to see the analogy between the two cases, and said he would visit San Jorge after leaving Rivas, to speak with the general of the allies on the subject.

From Rivas, Davis went to San Jorge. He demanded to know from the general of the allies if the Americans on the small steamers were held against their will, for such was the current report through the country at the time. Being informed that these men served the allies voluntarily, Davis was fully satisfied. He took no further steps to ascertain the facts in relation to these Americans, and contented himself with the unreliable assurances of a Spanish-American official. This apparent prepossession in favor of the allies was strongly resented by Walker; and so, when a lieutenant from the *St. Mary's* arrived to take possession of the *Narragansett's* boats, Walker told him he could not give them up unless Davis treated both belligerents alike and pressed his de-

mands against the allies with as much vigor as those he might make on the Nicaraguans.[14]

Shortly afterwards, the allies asked Davis to prevent the further landing of recruits for Walker at San Juan del Sur, alleging that such an act would be in complete conformity with the policy of the American Government, which on numerous occasions had prevented the departure of expeditions from the United States. Davis replied that while the officers of his government were bound to enforce the neutrality laws within the jurisdiction of the United States, this did not mean that naval officers must enforce such laws within the territory of foreign powers. He stated further that his government recognized a condition of civil war in Nicaragua, and was neutral as between the parties thereto. As a neutral, he would lend his aid to neither party, but would see that the property and lives of American citizens were duly protected.

In protecting American lives, Davis showed commendable zeal. A band of Costa Ricans fired on a party of sailors from the steamer *Orizaba*. They had been sent ashore to obtain water, and one of the sailors was made prisoner. Davis intervened and secured the man's release. Furthermore, on April 24, Davis sent Lieutenant Huston and a corporal of marines into the filibuster capital (Rivas), after securing the consent of the belligerents, in order to remove the women and children to San Juan del Sur under the protection of the American flag. Immediately after Lieutenant Huston entered the Nicaraguan camp, he was told to forbid his corporal to speak with the soldiers about facts or events at San Juan del Sur. In spite of this injunction, however, the corporal told exaggerated stories about the number of men the allies had at San Juan, and about their strength generally.

Lieutenant Huston remained in Rivas during the night of the 23d, and he frequently expressed his surprise at the cheerful and confident aspect of affairs in the place. Before leaving with the women, he informed Walker that Commander Davis had ordered him to say that any communication he had to make to Macdonald, the agent of the Transit contractors at San Juan del Sur, should be faithfully delivered. Walker replied, "he did not desire to write to Macdonald"; but added that Lieutenant Huston might say to Commander Davis, and as a communication for Macdonald, "he considered his position in Rivas impregnable to the force at

[14] Walker, 385-8.

the disposal of the enemy so long as his provisions lasted; if Lockridge did not join him in Rivas by the time his commissary stores were exhausted, he would abandon the place and join the force on the San Juan; and he considered himself wholly able to carry out such a movement." Macdonald afterwards told Walker that he never received this message. From this fact Walker inferred that Davis's offer was a mere effort to entrap Walker into writing something which might seem to justify Davis in the course he subsequently took.[15]

On the morning of the 24th, the women and children left Rivas in charge of Lieutenant Huston, and under the protection of the United States flag. Their departure was a great relief to Walker, as it removed one of the most serious obstacles to a movement from Rivas; and it was reasonable to suppose that their absence would inspire new spirit and resolution into the troops thus relieved of an inconvenient burden. Far from this, however, desertions, which had almost ceased since the 11th, recommenced after the 24th.[16]

While the situation at Rivas was growing more critical every hour, Captain Fayssoux, at San Juan del Sur, was being approached with bribes to surrender the *Granada*. It has been said that circumstances pointed strongly to the fact that Commander Davis was not in ignorance of this corrupt overture. At the special request of Davis, Captain Fayssoux had gone aboard the *St. Mary's* to meet Colonel Garcia, a representative of the Costa Rican general. Garcia made the proposal to Fayssoux, and the latter indignantly spurned it, turning his back on the corruptionist. Fayssoux being found to be impregnable to such sinister offers, another man was paid $5000 to betray the *Granada* into the hands of the enemy, but that scheme likewise failed.

The solicitude of Captain Davis for the success of the allies seems to have been shown in other ways also. Colonel Estrada, the allied commandant at San Juan del Sur, and Captain Fayssoux entered into a truce whereby each was to refrain from active hostilities for a certain period. Notwithstanding the fact that the agreement was honorably kept by Fayssoux, the enemy continued their erection of barricades in the town in violation of the truce. Though Commander Davis had suggested this truce, yet afterwards he held Captain Fayssoux strictly to its terms, while he

[15] Walker, 410-1.
[16] Walker, 411.

permitted Colonel Estrada to continue the building of fortifications.[17] But on the 27th of April, Captain Fayssoux sent word to Davis that inasmuch as the enemy were acting in bad faith, he would be compelled to fire upon them from the *Granada*. Davis thereupon sent his first lieutenant, Maury, to Fayssoux to ask if he would not wait until Davis heard from Rivas. Fayssoux replied that he would, if Davis would then go on shore and destroy the barricades. Lieutenant Maury could not answer that question. Fayssoux then told him that if the enemy did not stop, he would fire in half an hour. Lieutenant Maury then went to Colonel Estrada and said that Commander Davis looked on the truce as at an end, and that Fayssoux would fire in half an hour. Colonel Estrada wished to debate the question, and again pleaded ignorance; but Lieutenant Maury reiterated his statement that Fayssoux would fire. Estrada then agreed to let the barricade alone, and that the truce should be observed.

The first note was sent to Colonel C. J. Macdonald, and was shown by him to Commander Davis, who said that he would take Fayssoux if he did fire, as he thought it would be his duty. Macdonald was also requested by Davis to go on board the *Granada* and transmit Davis's threat. Macdonald asked for the threat in writing, and Davis offered to give it, but after further conversation on the subject, he sent the above message to Estrada. Commander Davis acknowledged to Macdonald that it would be Fayssoux's duty to fire if the enemy did not desist. To Fayssoux, this course of reasoning on the part of Davis was incomprehensible, on the supposition of Davis's neutrality. Fayssoux maintains that although he himself was perfectly aware of the treachery of the enemy at all times, and of their violation of the truce in building barricades in reach of his guns, he permitted them to go on to a certain extent, hoping to turn the barricades to his own advantage. And thinking it politic, he did not urge upon Davis his duty to destroy those already begun or completed, though he took occasion to let the officers of the *St. Mary's* know his views on the subject, and that he thought Commander Davis was easily satisfied with promises which were constantly broken; that he (Fayssoux) had had opportunities of gaining advantages, but had scrupulously kept the truce.[18]

[17] Jamison, "With Walker in Nicaragua," 1909, 157-8; Walker, 414 ff.
[18] Walker, 418-9.

By the end of April, Davis came to the conclusion that Walker's position in Rivas was no longer tenable; and he therefore visited the allies in the capacity of mediator, proposing to end the conflict by removing Walker and his American associates from the country. This proposition was readily assented to by the allies, as it achieved all that they were contending for, without further fighting or expense. Davis thereupon communicated with Walker. Several messages were exchanged before negotiations were finally undertaken. Early in the evening of April 30, the preliminaries were arranged, and Walker sent two envoys to Davis in the camp of the allies. Davis told them that he had full knowledge of Walker's situation, and that they could hold out only a few days longer. He knew that the Americans lacked food and were deserting in large numbers; and he proposed that the survivors should surrender to him, and that Walker and 16 officers whom he might select should go on board the *St. Mary's* and proceed to Panama, while the other officers and the men were to be taken to Panama by another route, accompanied by a United States officer and protected by the American flag. Such an astonishing demand had doubtless never before been made by a subordinate naval officer upon the President of a friendly government.

Henningsen, one of Walker's envoys, was inclined first to demur, saying that it was not yet certain that reinforcements would not arrive, in which event Walker could easily cut his way out of Rivas and embark in the *Granada* at San Juan del Sur. Davis then announced that he would not allow the *Granada* to leave port, but intended to take possession of her before he left San Juan. The conference lasted until two o'clock in the morning, when the envoys returned to Rivas, promising to give Davis Walker's answer the next morning at ten, if negotiations were not broken off.

Davis's announcement of his determination to seize the *Granada*, which would have cut off all hope of escape for Walker, made his proposition nothing less than an ultimatum, to which Walker found that he must agree or perish. Accordingly, articles of capitulation were drawn up at Walker's headquarters, and were accepted by Davis. The text of the agreement was as follows:

RIVAS, May 1, 1857.

An agreement is hereby entered into between General William Walker, on the one part, and Commander C. H. Davis, of the United States Navy, on the other part, and of which the stipulations are as follows:

Firstly: General William Walker, with 16 officers of his staff, shall march out of Rivas with their side-arms, pistols, horses, and personal baggage, under the guarantee of the said Captain Davis, of the United States Navy, that they shall not be molested by the enemy, and shall be allowed to embark on board the United States vessel-of-war, the *St. Mary's*, in the harbor of San Juan del Sur, the said Captain Davis undertaking to transport them safely, on the *St. Mary's*, to Panama.

Secondly: The officers of General Walker's army shall march out of Rivas with their side-arms, under the guarantee and protection of Captain Davis, who undertakes to see them safely transported to Panama, in charge of a United States officer.

Thirdly: The privates and non-commissioned officers, citizens, and employees of departments, wounded or unwounded, shall be surrendered, with their arms, to Captain Davis, or one of his officers, and placed under his protection and control, he pledging himself to have them safely transported to Panama, in charge of a United States officer, in separate vessels from the deserters from the ranks, and without being brought into contact with them.

Fourthly: Captain Davis undertakes to obtain guarantees, and hereby does guarantee, that all natives of Nicaragua, or of Central America, now in Rivas, and surrendered to the protection of Captain Davis, shall be allowed to reside in Nicaragua, and be protected in life and property.[19]

Fifthly: It is agreed that all such officers as have wives and families in San Juan del Sur, shall be allowed to remain there under the protection of the United States consul, till an opportunity offers of embarking for Panama or San Francisco.

General Walker and Captain Davis mutually pledge themselves to each other that this agreement shall be executed in good faith.[20]

At five o'clock in the afternoon of May 1, Davis entered the plaza of Rivas. After the text of the agreement between Walker and Davis was read, Henningsen stepped forward and announced to Walker's men that they were under the control of Commander Davis and under the protection of the American flag, and that they would be expected to yield to the naval officer the same implicit obedience that they had rendered to their former commander-in-chief. Henningsen then formally turned over the garrison to Davis, and the latter also spoke to the men, asking

[19] The lenity, unheard of before in Central American warfare, which the allies thus offered to the men whom they had vowed to exterminate, shows how highly they valued the services of Commander Davis in removing them from the country. That they did not keep their merciful promises to the native prisoners, but harried them in the good old-fashioned way as soon as the *St. Mary's* had sailed away, does not detract from the merit of their promise. They would doubtless have promised anything in order to be rid of the troublesome filibusters.—Roche, "Story of the Filibusters," 149.

[20] Walker, 424-5; Jamison, 159-60; Roche, 148-9.

them to assist him in carrying out his arduous task. Davis and Henningsen then repaired to Walker's headquarters, but found them unoccupied. While the proceedings just narrated were taking place, Walker and his chosen officers had procured horses and taken the road to San Juan del Sur, escorted by General Zavala, of the allies.

Walker and his chosen staff of officers, with the exception of Henningsen, took up their quarters on board the *St. Mary's* on the night following the surrender. Davis did not arrive until the following morning, when he proposed that Walker should surrender the *Granada* to him without the necessity of using force. The agreement had made no mention of this, and Walker accordingly declined to surrender the vessel. Davis, however, would not listen to Walker's arguments, and ordered his first lieutenant, Maury, to seize the craft. Maury boarded the *Granada*, and ordered Fayssoux to surrender. The doughty captain replied that he would do so only in the face of a superior force. The guns of the *St. Mary's* were then turned on the schooner, and the boats of the war-ship manned with a hundred armed men and a howitzer. Maury now told Walker that if he desired to avoid bloodshed, he should order Fayssoux to surrender. The fallen filibuster thereupon wrote Fayssoux this note: "Deliver the *Granada* to the United States." Soon afterwards the Nicaraguan flag came down and was replaced by that of the United States. The Nicaraguan navy was no more. Finally, to make the filibuster cup of bitterness full, Davis, on May 4, turned the *Granada* over to the Costa Ricans. The officer who took charge of her was a Jamaica negro.

"This act of Captain Davis," says a participator in the events, "joined to his previous conduct, convinced me then, and time has not changed my opinion, that it was merely the culmination of an agreement made by the English naval officers, the allies, and Captain Davis, that General Walker and the Americans should be expelled from Nicaragua." [21]

The survivors of the expedition, to the number of 364, were sent to Panama, where they were cared for by Commodore Mervine, commander of the Pacific Squadron. The women and children whom Davis had removed from Rivas during the hostilities, had been placed in the house of the American consul at San

[21] Jamison, 161.

Juan del Sur, and the officers of the *St. Mary's* contributed between $400 and $500 for their maintenance. These, with the sick and wounded, and the officers left behind by Walker, were taken to Greytown,[22] where surgeons from the British warship *Orion* assisted in caring for the ill. The American sloop-of-war *Cyane* then took the entire party, numbering 142, including 13 women and five children, to Aspinwall, where they arrived on June 16. A letter from an officer on board the *Cyane* thus describes their condition:

> Most of them were in a horrible condition. Many of them were at the point of death. Some were covered with wounds, others with disgusting sores, and all were lousy and dirty. . . . . We did all we could for them; but as bad weather set in, on the way back to Aspinwall, all had a hard time. However, only two died on board.[23]

Commodore Paulding, commanding the Home Squadron, endeavored to obtain passage for them to New York on some regular steamer, but the steamship company would agree only to take the well ones as far as New Orleans. The surgeons of the *Orion* insisted that the sick should be taken to a more northerly climate, and all were accordingly carried to New York and Boston in Paulding's flagship (the *Wabash*) and the *Cyane*. The sloop-of-war *Saratoga* was left on duty at Greytown.[24]

Meanwhile, Commodore Mervine, at Panama, found himself greatly encumbered with more than 300 of Walker's men. They were in great distress and a constant menace to the health of Mervine's own command. He finally sent them, by rail, from Panama to Aspinwall, whence they also found their way eventually to the United States.[25]

The only apparent authority which Davis possessed for his intervention was his instructions from Commodore Mervine to protect the persons and property of American citizens. It is true, the Secretary of the Navy had sent directions to Mervine to give Walker and such of his followers as were citizens of the United States an opportunity to retreat from Nicaragua, but Davis acted before these instructions were received. At any rate, the Navy

[22] The officer who escorted the 250 privates and non-commissioned officers to Virgin Bay is said to have cursed his job.—Roche, 150.

[23] Midshipman George H. Perkins, U. S. N., quoted in Alden's "George Hamilton Perkins" (1914), 54.

[24] Meade, "Life of Paulding," 172 ff,

[25] Scroggs, 294-307, *passim*.

Department approved all that Davis had done, except his seizure of the *Granada* and her delivery to one of the belligerents. Some persons have held that Davis's secret orders were no other than that he should aid the allies in forcing Walker and his men out of Nicaragua.[20]

Walker claims that these orders were given to Secretary of State Marcy by Cornelius Vanderbilt, President of the Accessory Transit Company, and that Marcy gave them to Commodore Mervine, who was an intimate friend of Marcy's. Davis, however, claims that he acted on his own responsibility, and solely in the interests of humanity, in order to save Walker in spite of himself.

Davis's son (and biographer) says: "He knew perfectly well that Walker deserved his fate; but he could not lie still in the *St. Mary's* at San Juan del Sur and see American citizens butchered in cold blood within reach of his arm, no matter how criminal or misguided they might be." . . . . The fact is, Davis saved Walker's life, and the lives of his officers and army; for that there would have been a general massacre at Rivas, following capitulation, no person conversant with the situation and the character of the people engaged ever doubted. It was admitted by several of Walker's own officers. Davis himself wrote from Mare Island, in March, 1858, as follows:

> Among the things which I put down to mention to you, is my having received numerous calls from officers of the army in San Francisco and here. . . . . They all spoke of the affair at Rivas, and adopted the view that I saved Walker and his people from the terrible fate of Colonel Crabbe and his party in Mexico. It was apparently the object of their call to express their approval of my course, and sympathy with me in relation to Walker's attacks. General Sanders sent me a note, of which the inclosed is a copy. [The note was extremely flattering.] He was the third in command at Rivas. General Frey, by far the most respectable American officer Walker had with him in character and talents, and a very pleasant gentleman, called with a party of friends to pay his respects and offer his thanks and congratulations. . . . . The right view of my conduct seems to have been taken in San Francisco. . . . . I have no feeling now on the subject, but I shall never cease to wonder at the delusion of the South in accepting Walker's assertion that I *forced* him to leave Rivas. I will dismiss the subject by saying . . . . that I have one feeling paramount to all others, and that is gratitude that I was relieved from the horror of witnessing the slaughter of my countrymen, as it occurred in Havana and in Lower California, without the

[20] Roche, "Story of the Filibusters."

ability to succor them. This would have been a calamity as enduring as my life. I thank God that He permitted me to escape that.[27]

Posterity, however, is inclined to regard Davis's conduct as reprehensible. To quote the words of one authority:

Never has the government of the United States lent itself to the designs of predatory wealth so disgracefully and so flagrantly as it did when, at the dictation of Cornelius Vanderbilt, and without a shadow of right or excuse, it used the American Navy to oust William Walker from the Presidency to which he had been legally elected by a sovereign people. Its unjustified persecution of Walker, to serve the spite of a money-lord, forms one of the darkest stains on our national history.[28]

Walker's reception in New York, on his return to the United States, was like that of a conqueror. He went to Washington to lay before the State Department his complaint against Commander Davis, and was received with diplomatic politeness; but the case was referred to the consideration of Congress, where it was effectually buried under a mountain of verbiage. Thence Walker made a journey through the South, being welcomed and fêted with even more enthusiasm than he had received in the North.[29] He soon began fitting out an expedition to re-enter Nicaragua and resume the rights and powers of which he so resolutely maintained he had been wrongfully deprived.[30]

---

[27] Davis, "Life of Davis," 102-4.
[28] Powell, "Gentlemen Rovers" (1913), 207-8.
[29] Roche, 159.
[30] Jamison, 163-4.

[TO BE CONTINUED]

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

Ballots for Election of Officers

Members are requested to return the signed ballots for the election of officers of the U. S. Naval Institute, 1918-1919, as soon as possible after their receipt.

Dues

Regular and associate members of the U. S. Naval Institute are subject to the payment of the annual dues until the date of the receipt of their resignation.

Book Announcements

Routine Book, 1918, by Captain Reginald R. Belknap, U. S. Navy, will be ready for issue about August 1. The *Routine Book* in a concise form comprises the general features of organization, administration and ordinary station bills in the service and is applicable to all classes of vessels. Unbound copies of the *Routine Book* for bulletin board purposes may be obtained if desired. The table of contents may be found in the book list.

Mooring Board problems, solved on the latest form of Martin's Mooring Board, have been prepared by the Department of Seamanship, U. S. Naval Academy, and will appear in the new edition of Seamanship Department Notes, ready for issue about August 1.

Prize Essays 1919

The attention of all the members and the subscribers to the U. S. NAVAL INSTITUTE PROCEEDINGS is invited to the new rules governing the Prize Essay contest for 1919 under the heading of Special Notice in this number. It is requested that authors who are writing or who contemplate writing essays submit them at their earliest convenience, as the Institute is in pressing need of articles for publication in the PROCEEDINGS.

Topics for Essays

The board of control invited the Chief of Naval Operations, Commanders-in-Chief of the U. S. fleets, Chiefs of Bureaus, Presidents of the U. S. Naval Institute and Naval War College, and the Superintendent of the U. S. Naval Academy to suggest topics for essays. The suggested topics received to date will be found

opposite the Special Notice, and the list will be added to as the suggestions are received.

Membership

Since April 41 regular members have joined the Institute. Total membership 4925.

Deaths:

Rear Admiral T. Perry, U. S. N.
Captain G. H. Buffinton, U. S. N.
Commander B. W. Wells, U. S. N.
Lieutenant H. R. Ford, U. S. N.
Naval Constructor W. H. Varney, U. S. N.
Lieutenant W. O. Manchester, U. S. N.
Lieutenant Guy Norman, U. S. R. F.

Resignations: Nine.

Address of Members

Several hundred copies of the PROCEEDINGS have been returned, because of the lack of proper address, *all members are urged to keep the Secretary and Treasurer informed of the address to which* PROCEEDINGS *are to be sent, and thus insure their receipt. This precaution is now of particular importance as notices of changes of stations are not now available for the use of the Institute's staff.*

Members and subscribers are urged to notify the Secretary and Treasurer promptly of the non-receipt of PROCEEDINGS, in order that tracers may be started. The issue is completed by the 10th of each month.

Book Department

The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers.

Reprints of Articles

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

Illustrations

Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Suggestions Invited

Members are invited to send to the Secretary comments, suggestions or criticisms on the make up of the PROCEEDINGS, and to submit topics for essays.

Notice

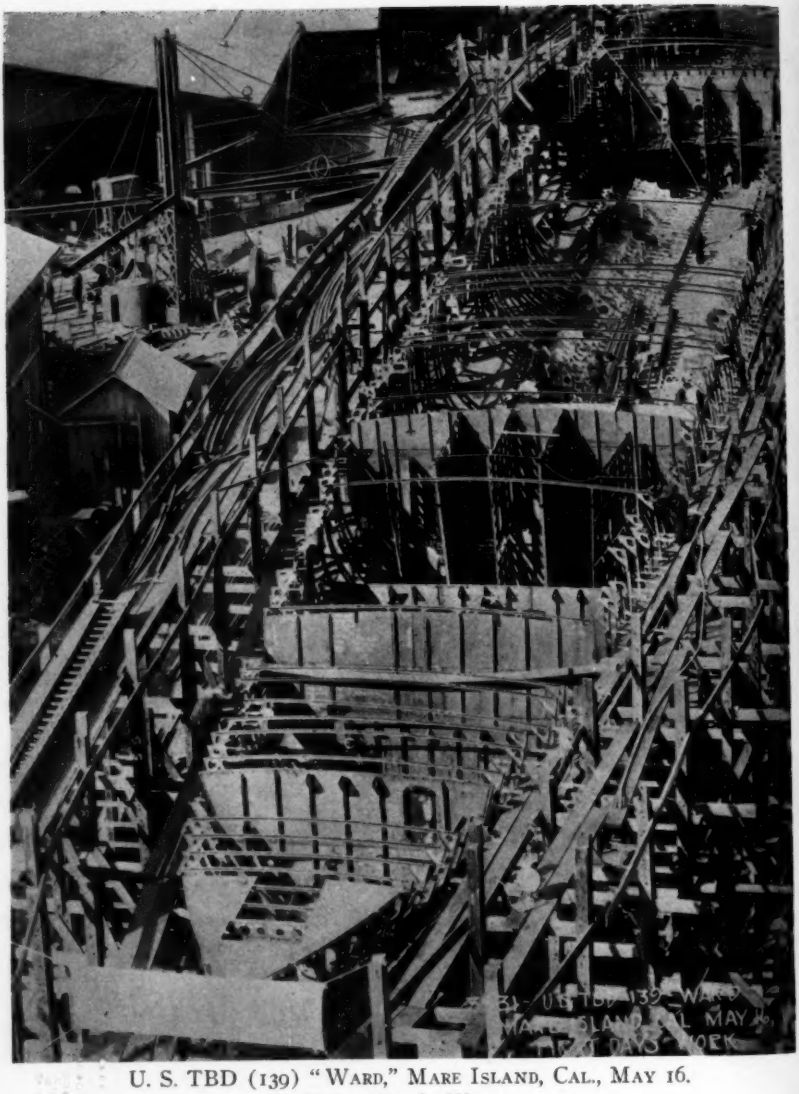
Whole Nos. 145, 146, 147, 149, 155, 166 and 179 of the PROCEEDINGS (March, 1913, June, 1913, September, 1913, January-February, 1914, January-February, 1915, and November-December, 1916, January, 1918) are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 25 cents per copy.

ANNAPOLIS, MD., June 8, 1918.

INFORMATION INDEX

PAGE

ADVERTISEMENTS, INDEX TO 1
PUBLICATIONS, U. S. NAVAL INSTITUTE ..... (2)
SPECIAL NOTICE 1736
TOPICS FOR ESSAYS 1737
LIST OF PRIZE ESSAYS 1738



U. S. TBD (139) "Ward," Mare Island, Cal., May 16.
Fifth Day's Work.

PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT W. B. JUPP, U. S. NAVY

GENERAL ARRANGEMENT

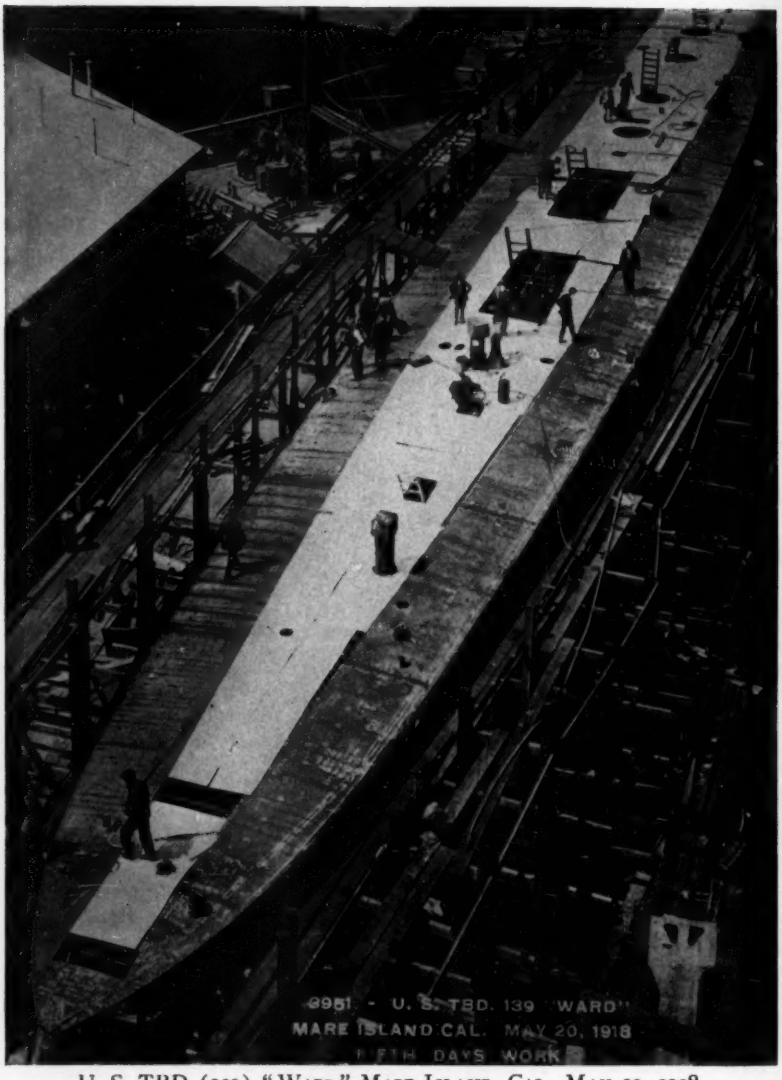
		PAGE
VESSELS BUILDING.	Brazil	1551
CHARACTERISTICS OF NAVAL VESSELS AND AIRCRAFT.	Germany	1551
NAVAL POLICY.	Great Britain	1553
MATÉRIEL.	Holland	1554
PERSONNEL.	Portugal	1555
OPERATIONS.	United States	1556
MERCHANT MARINE.		
ORDNANCE AND GUNNERY		1577
RADIO AND NAVIGATION		1593
ENGINEERING		1599
AERONAUTICS		1612
MERCHANT MARINE		1633
MISCELLANEOUS NOTES		1640
CURRENT NAVAL AND PROFESSIONAL PAPERS		1642

BRAZIL

BRAZIL IN THE WAR.—Because not much has been heard about Brazil's share in the war, it must not be presumed that she is doing little or nothing. As a matter of fact, conscription is in force and every possible preparation is being made to strike a heavy blow in Europe. Brazil's ships are patrolling the coast of South America and other ships have gone to European waters, where they are operating with the allied navies. The Brazilian Navy includes several dreadnoughts of good speed and heavy offensive power.—*Scientific American*, 8/6.

GERMANY

GERMAN SUBMARINES.—The fact that the State Department at Washington has been officially informed that a German submarine of the latest seagoing type bombarded the port of Monrovia, the capital of Liberia, on the west coast of Africa, on April 10, would indicate that the Germans are putting afloat submarines of large power with a view to more extensive sea operations. The latest type of German submarine is supposed to be 2400 tons, 260 feet long, 25 feet in beam, with 19,000 horsepower. The speed is said to be 26 knots on the surface, and 14 knots submerged and the cruising radius is given as 8000 miles. They carry a crew of about 60 to 80 men. There is also said to be launched an even larger class of submarine of 5000 tons, 400 feet long, with a cruising radius of 18,000 miles. The new submarines are very heavily armed.—*Army and Navy Journal*, 20/4.



U. S. TBD (139) "WARD," MARE ISLAND, CAL., MAY 20, 1918.
FIFTH DAY'S WORK.

HUNS INTEND TO DECLARE ATLANTIC COAST IN NEW DANGER ZONE.—The German Admiralty intends to declare the eastern coast of the United States from Mexico to Canadian waters a danger zone, and will warn neutral shipping, says a despatch to the *Exchange Telegraph* from Amsterdam, quoting reports received from Berlin.—*N. Y. Herald*, 14/6.

GERMAN HIGH SEAS FLEET PREPARING FOR BIG OFFENSIVE.—Further evidence that Germany, in its efforts to end the war this summer, is arranging to support its land offensive by sending its high seas forces against the combined British and American grand fleet is given in an official despatch from Switzerland.

"A telegram of an official nature," says the despatch, "is being spread broadcast in Germany which says that the German Admiralty is considering a big naval offensive. Orders are supposed to have been given to keep the whole fleet in readiness, and a certain number of naval officers of high rank have been recalled from Switzerland and other neutral countries where they have been spending their leaves.

"The *Kieler Zeitung* speaks of extraordinary activity in the ports, and the *Hamburger Post* publishes an interview with Von Tirpitz, who was asked if Germany was in a position to measure herself with the English fleet. The admiral naturally replied in the affirmative, saying that after their land forces have pushed the French and English back on the other side of Paris it will be the turn of the Kaiser's boats to drive the English off the high seas."

Both in Washington and in the allied capitals a German sea offensive on a grand scale long has been regarded as a possibility and the appearance of the Teutonic fleet in the North Sea at any time would not be unexpected. Rear Admiral Gleaves said in a public address not long ago that word has come to the British fleet that the Germans at last were ready for the supreme test.

American Dreadnoughts with English Fleet.—If the battle does come American naval forces will play their part. American dreadnoughts under Rear Admiral Hugh Rodman joined the British fleet some time ago, and Admiral Gleaves in his recent address said that when Admiral Beatty, commanding the British grand sea forces, heard that the Germans were coming, he assigned to the American ships a prominent place in the line.

American naval officers are no less anxious for a finish fight with the enemy than are the British. In all allied quarters there is supreme confidence of the outcome. Once the two fleets come to grips, officials are certain that the Germans will be defeated decisively.—*N. Y. Herald*, 12/6.

GREAT BRITAIN

THE ROYAL AIR FORCE.—The Royal Naval Air Service and the Royal Flying Corps are formerly amalgamated and become the Royal Air Force. The actual amalgamation is only the completion of a long work of preparation, but there is good reason to see in it the outward symbol of a change of organization which should have very important results upon the whole future of the men who fight the battles of the air. The old system was an improvisation and—what was worse—was the survival of a day when the flying man was looked upon as a mere accessory—and by no means one of the most important accessories—of the two services. The result was a duplication—of staffs, of personnel, of programs of construction, of requisitions, of every detail of organization and supply. That the consequences were not more mischievous was a piece of good fortune which we owe to the men who had common sense to administer an unneccessarily complicated system with a single eye to the necessities of the fighting arm that they controlled. How fortunate the country was in them is to be seen in the superb record of the airmen from the very beginning of the great battle. There could hardly have been a more trying time to carry through the reorganization of the two services.—*London Times*, 1/4.

HOLLAND

HOLLAND ANGERED AT TORPEDOEING OF HOSPITAL VESSEL.—The sinking of the *Koningin Regentes* has aroused much indignation throughout Holland, and this feeling has found expression generally in the newspapers.

"The mad sea brute has done his noble work," says the *Nieuwe Courant.* "Unless the German Government accepts full responsibility for this crime it is in duty bound to name the individual who is responsible for the murder of those on board this neutral hospital ship."

The *Nieuwe Rotterdamsche Courant* thinks there is room for doubt that that the ship was torpedoed.

"This ship," says the newspaper, "was a paddle steamship, and the Germans insisted on the use of such ships because they could be easily distinguished at a distance by submarine commanders."

The newspaper adds that on the eve of the fresh negotiations over the exchange of prisoners the disaster has created an atmosphere of distrust which will not help them.

"The Germans deny that they sank the *Koningin Regentes,* and say that a submarine could not have known whether or not the British delegation was on board," the *Nieuwe Amsterdamsche Courant* says. "The Dutch, however, have had experience of German official denials before and they are not impressed."—*N. Y. Herald,* 11/6.

DUTCH TO SEND SHIPS IN ARMED CONVOY.—Jonkheer J. Loudon, Minister of Foreign Affairs, announced in the Second Chamber to-day that it was intended to send several steamships to the Dutch East Indies under an armed convoy and accompanied by a collier. He said he could not say definitely that no international difficulty would arise out of convoying ships, but presumed that this act probably would not meet with interference.

The entente allied governments, he said, have been informed of this decision by the Netherlands Government.—*N. Y. Herald,* 18/5.

TWO GERMAN STEAMERS TURNED OVER TO DUTCH.—Two German ships will sail in the near future from the Dutch East Indies to Holland as Belgian relief ships, according to a Rotterdam telegram to the *Nieuwe Rotterdamsche Courant.* The German vessels, the dispatch states, have been placed at the disposal of Holland by the German Government to replace two of the six Dutch ships which were torpedoed in the English channel on February 22, 1917.—*Evening Star,* 28/5.

MUST SEND OWN SHIPS, U. S. INFORMS HOLLAND.—Holland has been notified by the United States Government that her request for three ships now in American ports to carry the balance of the grain promised her by President Wilson cannot be granted, and that to prevent further delay in the movement of the grain Dutch ships should be sent for it at once.

More than 400,000 tons of Dutch shipping are idle in Dutch ports, according to information in the possession of the State Department. It is from that fleet of tied-up tonnage that the War Trade Board holds the ships necessary to transport the grain in the United States should be taken.

The prohibition of the sailings of all Dutch ships from Dutch ports, the Rotterdam correspondent of the *Daily Telegraph* says he learns is connected with a new move by the German Government to compel Holland to sign on Berlin's terms the long-pending economic agreement, which Holland has declined to do owing to the onerous conditions imposed by Germany.

The German Government, accordingly, has refused a safe conduct to Dutch shipping through the safe zone and seized the steamship *Megrez,* which Holland chartered to fetch a cargo of wood from Sweden. The seizure was a direct challenge to Holland, and, it is added, the prohibition of further sailings is the sequel.—*Washington Evening Star,* 23/5.

DUTCH SHIPS TIED UP AID ALLIES, HUNS SAY.—In its latest alteration of German prize rules, according to a report from the Dutch Minister in Berlin, the German Government takes the view, which is fully applicable to Dutch shipping, that ships laid up in harbors do not count. Therefore the tonnage in Dutch ports is deducted from the total and Germany reaches the conclusion that the greater part of Dutch shipping is navigating in the service of the Allies.

It is pointed out by Berlin, however, first, there is no question of attacks without warning or destruction outside the danger zone, and, second, the differences raised by Germany would vanish if an arrangement were reached regarding conditions by which Germany would be ready to grant safe conduct to Dutch ships.—*N. Y. Herald*, 25/5.

PORTUGAL

PORTUGAL PLAYS HER PART IN GREAT WAR.—The Viscount de Alte, Envoy Extraordinary and Minister Plenipotentiary from Portugal said:

"Our aims are like those of the United States. We have nothing whatever to gain in the war and are fighting solely for a principle—for the right of a nation to determine its own affairs without dictation from outside. Under these circumstances it is a little discouraging to find that many even of your officials do not know we are in the struggle. Our ships are sometimes held up, just as if we were neutrals. I have been asked recently by men who should know better whether it is likely that Portugal will be drawn into the war.

"Portugal has nearly 50,000 men in the trenches in France. Her troops hold a section of perhaps 10 miles adjoining the British southeast of Armentieres. It must be remembered that though the British, the Portuguese and the Belgians defend only one-third of the line along the western front, there are opposed to them one-half of the German divisions. The difficulty of the terrain and the number of the opposing troops make it necessary to man these trenches more thickly than at other parts of the line.

"*30,000 Troops in Africa.*—The little republic has also nearly 30,000 men fighting in East Africa a campaign of the most arduous kind. Germany is here making her last stand for colonial empire. She has armed the warlike blacks with machine guns and rifles. The German commander has crossed into Portuguese territory, where the joint armies of Great Britain and Portugal are slowly wearing down and destroying his forces. The climate is a deadly one to Europeans and the sight of a returning troop ship, filled with fever-stricken victims of the African swamps, is one to fill the heart with pity. Yet the soldiers of the small republic have no complaint to make. They, too, are devoting themselves to the duty that calls them.

"*Is a Poor Country.*—A great number of Portuguese laborers are working in the munitions factories of France and England to release men needed at the front. Portugal could readily furnish more soldiers, but the difficulty of transportation, of securing supplies and the expense of maintaining them make a larger army not feasible.

"Portugal is a poor country, already deeply in debt, and the expense of of this war presses heavily upon her.

"The republic of Southwestern Europe came into the war to meet her treaty obligations. Her parliament announced its readiness to stand loyally by these whenever England should call upon her. The need came when the Allies, as a counter-stroke to the submarine warfare, asked Portugal to seize the interned German shipping lying in her ports. This was done. Eighty per cent of these German ships were turned over to England to aid her carrying trade. Berlin retorted by declaring war upon Portugal.

"Already Portugal had shown where her sympathy lay by shipping artillery—a modification of the French 75—to England, whence it was transferred to Flanders for the use of the Belgians.—*Baltimore Evening Sun*, 29/4.

UNITED STATES

BUILDING

BILL CARRYING $1,587,000,000 IS REPORTED TO THE SENATE.—After increasing the Naval Appropriation Bill $202,840,000 over the total carried as it passed the House, the Senate Naval Affairs Committee to-day reported the bill to the Senate. The Senate committee bill appropriates $1,587,000,000.

Among increases by the committee are $900,000 for the Washington navy yard.

The measure's total is $63,053,127 less than was appropriated for the navy for this fiscal year in the regular naval bill and in deficiency measures.

Emphasizes Three-Year Program.—The Senate committee redrafted to make most emphatic the provision in the House bill for the beginning of work on the three-year building program by July, 1919. Construction of the great fleet of superdreadnoughts and battle cruisers provided in the 1916 naval bill has been held in abeyance in order that the building of destroyers to battle German submarines might be rushed.

To man the capital fleet when it is completed, the Senate provided for a permanent increase in the enlisted personnel of the navy to 131,540, nearly three times the number of men in the navy before the war. The President also would be authorized to increase that strength by 50,000 men for the war.—*Evening Star*, 21/5.

DESTROYER LAUNCHED IN 17½ DAYS.—The United States destroyer *Ward*, under construction at Mare Island, Cal., was launched June 1, 17½ days after her keel was laid. The boat was 84 per cent complete at launching. The shell was riveted up with all outboard valves, bilge keel, fenders and propeller guard in place; water-tight bulkheads and structure stanchions complete; boiler and engine foundations, deckhouses and fittings, mast and top-mast, installed, and the deck all riveted except where left bolted for installing boilers. In acknowledgment of this achievement Secretary Daniels said: "I have received a telegram from Mare Island, Cal., stating that the destroyer *Ward*, under construction at our navy yard there, was launched last evening, June 1, at 8.30 o'clock. The keel of this vessel was laid at 7.30 a. m., on May 15, 17½ days prior to the launching. This is a world's record for the construction period on the building ways, the previous world's record being the launching of a cargo vessel about 333 feet long by the New York Shipbuilding Co., Camden, N. J., in a little over 27 days. In making this remarkable destroyer record as much structural work as possible was prepared in advance, ready for erection and assembling before the keel was laid. Bulkheads, sections of the keel, deckhouses, bridge structure and a section of the stem of the vessel were riveted up ready for assembling in place on the ways. While the Mare Island navy yard has a well-earned record for expeditious and efficient work in new construction, the performance on the *Ward* is the culmination of its efforts, showing the excellent spirit and energy of the navy yard workmen and officers. While the record on the *Ward* will probably stand for some time, since the beginning of the war with Germany the efforts of the department to expedite destroyer construction have met with decided success due to the earnest co-operation and endeavors of the building yards concerned."—*Shipping*, 8/6.

Destroyers *Breese* and *Gamble* were launched at the Newport News shipyard with fitting ceremony. The *Breese* left the ways at 10.15 o'clock, followed 15 minutes later by the *Gamble*. Both vessels took the water without a hitch. Five minutes after the first destroyer left the ways another keel was laid and ten minutes after the *Gamble* slid into the water, the second keel was down. Mrs. Gilbert McIlvaine, daughter of Captain Kidder Randolph Breese, for whom the vessel is named, christened the *Breese*. The *Gamble* is named jointly in memory of Brevet Lieut. Colonel John M. Gamble, U. S. M. C., and Lieutenant Peter Gamble, U. S. Navy. Miss Evelyn Jackson, of Richmond, Va., was sponsor.—*Shipping*, 18/5.

MINE-SWEEPER LAUNCHED.—Without ceremony, the 700-ton mine-sweeper *Brant*, the third boat of the kind to be launched at the Sun Shipbuilding Co. plant this month, slid from its ways into the Delaware River on the evening of May 30. Only officials of the company and a few workmen were in attendance. Miss Elois Graham, daughter of J. K. Graham, manager of the hull department, christened the ship. When the *Brant* glided into the Delaware she steamed away under her own power, ready to take her place in the United States service.—*Shipping*, 8/6.

DESTROYER MAKES 38 KNOTS IN TRIAL.—An American torpedo-boat destroyer put in here to-day after a trial spin with the figures 38, indicating her speed in knots, standing out boldly on her superstructure.

The vessel, soon to be placed in commission, went to sea later for other endurance tests.—*N. Y. Herald*, 15/5.

BIG SHOWING IN DESTROYERS.—A gratifying showing is being made in the construction of destroyers for the navy, and several of them have been specially advanced in order that the launching may take place on July 4. On that date also there will be launchings of a large number of vessels which are being built under the Shipping Board. At one plant, for example, there will be 10 or 12 launchings of both destroyers and Shipping Board ships. The destroyers are now being built in less than one-half the time formerly required on this type of vessel. This is gratifying to the naval authorities considering the difficulties under which ship construction is new being conducted. The efficiency of labor everywhere is low, mainly due to the large numbers of comparatively inexperienced men who are being employed at enormously high wages. At the navy yards there is reported some discontent among employees, but it is at the private plants that the greatest difficulty is encountered, making it more and more necessary for the War Industries Board to determine priority and allocate facilities.—*Army and Navy Register*, 1/6.

A CHANGE IN NOMENCLATURE.—In future, it is announced at Washington, seagoing submarines are to be distinguished from the coastal type by a double-letter designation. For instance, the first of the new seagoing class, *i. e.*, the 1000-ton submersible *Schley*, has been re-named the *AA-1*, the name *Schley* being transferred to a destroyer. Large submarines which follow the *AA-1* class will be known as the *BB* or *CC* or *DD* class. Smaller submarines, built for coast defence purposes, are to retain the single letter to indicate the type to which they belong, with a numeral attached to identify individual boats.—*The Engineer*, 17/5.

OFFICIALS TEST NAVAL SEAPLANE AT FLUSHING BAY.—*New Craft Shows Adaptability for Coast Defence Work in Trials.*—Under the direction of the Naval Aviation Board, a trial and inspection was made at College Point of one of the new seaplanes that has been designed particularly for coast defence work abroad. The inspection was at the plant of the L. W. F. Engineering Company, where certain work in connection with the new craft is under way.

Lieutenant Wesson was in charge and made a trip in a seaplane driven by Ensign Slater. There was a flight over Flushing Bay, and the availability of the new craft was shown in the fact that it was driven in and out among the many craft anchored there.

No details of the seaplane, beyond the fact that it was driven by one of the most perfect of the new Liberty motors, was given out, nor would any information be given as to the Navy Department's arrangements for its use.

Favorable comments were made concerning the behavior of the seaplane by the navy officials present.

MATÉRIEL

INCREASED COST OF NAVY ARMOR PLANT.—The navy armor-plate plant at Charleston, S. C., will cost at least $20,000,000 when it is built, "or more," according to the estimates of the naval authorities, who are encountering great difficulty in obtaining material and mechanism at anything like the prices which prevailed a year ago. Something of this sort was anticipated in the discussions that ensued at the time the government armor plant was first proposed and when it was expected the cost would be about $12,000,000. There were experts at that time who regarded the project as unwise and costly beyond what was the initial estimate, and their judgment in the matter is now being sustained. An example of increased cost is afforded by the item of armor press for the power plant at Charleston. The estimate was $400,000, while the lowest bid received was $2,500,000, representing only a year's difference in machine tools. Another instance of increased cost is that of a gun lathe for the Washington navy yard for turning large guns. This would have cost $30,000 a year ago; to-day it costs $250,000. This condition has not, however, discouraged the Secretary of the Navy, who believes that the work on the armor plant should progress, although he is not demanding any priority for the materials for it over war necessities. The conservative view at the capitol, and one entertained by some naval officers, has been that work might very profitably be suspended on the armor plant in view of the demand for material and the urgent need of labor, with shortage of both, in the production of supplies required in the conduct of the war.—*Army and Navy Register*, 8/6.

$6,500,000 ON ACADEMY.—More than $6,500,000 will be expended at the Naval Academy on work which has already begun or which has been authorized. The largest item is $2,850,000, for the additions to Bancroft Hall, the quarters of the midshipmen, which are already well advanced. The next largest item is $2,500,000 for a new navigation and seamanship building, which will also contain a spacious auditorium. Other large items are: $450,000 for a radio plant and auxiliary building; $320,000 for a new power plant; $300,000 for additions to the marine engineering building, and $100,000 for a garage.

The additions to Bancroft Hall consist of wings extending at right angles to the main building on the southeast side. The east wing, which is expected to be completed by September 1, will contain 283 rooms, each accommodating two midshipmen. The west wing, which is to be completed by February 1, 1919, will contain 290 rooms of the same size. The original building contains a slightly larger number of rooms than the two additions, so that the whole building will accommodate more than 2300 midshipmen. However, one wing will not be completed when the new academic year begins, and some midshipmen will still have to be supplied with temporary quarters for a time.

The construction of the seamanship and navigation building is assured by the agreement of the House conferees to the item proposed by the Senate. Particular interest centers in the new auditorium. It will seat 3000, the chapel, the largest auditorium now at the academy, holding only 1100. The greatest effort has been made to follow the most approved principles in acoustics in its construction, the services of Hugh Tallant, an authority on the subject, having been secured. The building will consist of a basement and first floor devoted to instruction purposes, topped by the auditorium, which will contain a gallery. The building will be in the form of a Grecian cross.

The east wing of Bancroft Hall is now used as a seamanship and navigation building and gymnasium combined. Both departments are in urgent need of larger quarters with the great increase in the number of midshipmen. When the department of navigation and seamanship is moved to its new quarters the whole building will be used as a gymnasium, and a number of improvements will be made for its greater usefulness in this line.

For the present the radio station across the Severn River from Annapolis is the most powerful station in the world, but within a few weeks it will yield the palm to the station which the government is constructing in France. The local station has four steel towers, each 600 feet high, but the station in France will have eight 850-foot towers. Communication between the two is expected to start in August.

The scope of the work on hand and the amount of expenditures exceeds anything undertaken at the Naval Academy except the original construction which converted what had been the Academy from 1845 to the period of the Spanish-American War into the "New Naval Academy."—*Baltimore Sun*, 16/6.

$202,840,000 TACKED ON HOUSE NAVY BILL BY SENATE REDRAFT.—Carrying a total of $1,587,000,000, or $202,840,000 more than provided by the House, the Naval Appropriation Bill was completed late to-day by the Senate Naval Committee, and will be reported to the Senate to-morrow. The measure's total is $63,053,127 less than was appropriated for the navy for this fiscal year in the regular naval bill and in deficiency measures.

New projects added to the House bill by the committee included—Construction at a cost of $9,150,000 of a nitrate plant at Indian Head, Md.; purchase for $425,000 of 4900 acres of land at the Marine Corps Training Station at Quantico, Va.; erection of new buildings at the Naval Academy to provide room for additional midshipmen, $2,500,000; equipping navy yards for ship construction, $6,000,000; mine depot, $3,000,000.—*N. Y. Herald*, 21/5.

PERSONNEL

MIDSHIPMEN GRADUATED.—200 midshipmen were graduated on June 6. The graduating address was made by the Secretary of the Navy.

GRADUATION OF RESERVISTS AT ANNAPOLIS.—A class of 450 young ensigns of the reserve force received their certificates at Annapolis on Wednesday, after having completed a course of 15 weeks of intensive training at the Naval Academy. Franklin D. Roosevelt, Assistant Secretary of the Navy, presented the certificates and made an address to the class. The new officers will be temporarily commissioned and after a week's leave will report at the stations to which they have been assigned. A new class of reserve officers, consisting of 700 members, will be formed here on June 11.—*Army and Navy Register*, 1/6.

NAVAL RESERVE OFFICERS' SCHOOL.—A class will be assembled at the Naval Academy, Annapolis, for an intensive course of training with a view to qualifying for appointments in the line of the Naval Reserve Force. The class will consist of 700 members, and will assemble at Annapolis on June 10. The course will cover 16 weeks, during the summer period of the Naval Academy. About 100 of the student officers will specialize in engineering duties, and the remainder of the class will be instructed in the duties of the deck force. The navy pay officers reserve school will also assemble at the Naval Academy at the completion of the present course at Catholic University, Washington.—*Army and Navy Register*, 1/6.

SUMMER CRUISE OF MIDSHIPMEN.—Arrangements have been made by the Navy Department for the summer cruise of midshipmen. The classes will embark at Annapolis the day after graduating exercises at the academy, the midshipmen being assigned to the various battleships and armored cruisers of the fleet. There will be no regular midshipmen's practice cruise as conducted in peace times, but they will be given a course of practice with the fleet, and will be returned to Annapolis in time to give the young men a short leave of absence before resuming their studies in the fall.—*Army and Navy Register*, 1/6.

NAVY STEAM ENGINEERING SCHOOL.—The United States Navy Department has perfected plans for the enrollment and training of considerable numbers of engineering officers. A school for this training known as the United States Navy Steam Engineering School has been established at the Stevens Institute of Technology, Hoboken, N. J., under the guidance of Dean F. L. Pryor as civilian director.

The course consists of five months' training, divided as follows: One month of military training at the Naval Training Camp, Pelham Bay Park, New York; one month at the United States Navy Steam Engineering School; two months' practical training on board ships and in repair shops in the vicinity of New York; one month finishing course at the United States Navy Steam Engineering School.

The school is open to men between 21 and 30 who are physically qualified, of thorough ability and officer-like character, and who have completed the engineering course at any recognized technical school.

This school presents particularly desirable opportunities to the young technical man, both in affording him a proper outlet for his trained facilities during the war and in rounding out his college work with a practical course and school experience which will be of value to any engineer.

The service that a graduate from the school will perform will be that of an engineer officer in the auxiliary service of the navy. A graduate of the school will be commissioned an ensign in the Naval Reserve Force.

Information has been sent to all registered technical schools and should be on file at the president's office. For any additional details application can be made to the Civilian Director, United States Engineering School, Stevens Institute, Hoboken, N. J.—*Marine Engineering*, 18/6.

OFFICERS' MATERIAL SCHOOL, NAVAL AUXILIARY RESERVE—(ENGINEER OFFICERS).—The Officers' Material School, Naval Auxiliary Reserve, will, beginning August 1, 1918, in addition to graduating 200 deck officers per month as noted in reference (a), graduate 100 officers for engineering (steam) duties per month.

The training course is of four months' duration, the first month at Stevens Institute, where the preliminary training in boilers, engines and auxiliaries will be given; then two months' practical work which will be given on coastwise ships, sound and river steamers, tug (tow) boats, ferries and the different repair plants in the vicinity of New York Harbor; then one month of final training in organization, routine, care and upkeep, repairs, navy regulations, duties of engineer officers and assistants, at Stevens Institute.

Commandants of districts will transfer to the Supervisor, Naval Auxiliary Reserve, Ferry Terminal Building, South and Whitehall Streets, New York City, with records and pay accounts, the following quotas:

1st District—4 men per week.
3d District—6 men per week.
4th District—4 men per week.
9th District—6 men per week.
12th District—3 men per week.
13th District—2 men per week.

The first quota shall arrive on March 27, and a similar quota on each Wednesday thereafter.

The men selected from the above districts for this training must meet the following qualifications:

(a) Men of ability and officer material.
(b) Age 21 to 30 inclusive.
(c) Completed high school course and graduate of engineering course at a recognized technical school or an equivalent of above.
(d) Must be regular navy, N. N. V., or N. R. F. (any class) for general service.
(e) Physically qualified for line officer—standard of regular navy.

Men newly enrolled specially for this course will be enrolled as M. M. 2d Class. Men already enrolled in lower ratings may be rated M. M. 2d class on being transferred to take this course.

These men will, upon reporting to the supervisor, be sent by him to Pelham Bay Park for one month's military training, completion of outfits, inoculations, etc., and then return to the officer of the supervisor, Naval Auxiliary Reserve, for duty at the U. S. Naval Steam Engineering School at Stevens Institute, Hoboken, N. J.

Men who at the completion of their course or at any time during the course do not prove to be competent officer material, will be given appropriate ratings by the supervisor, Naval Auxiliary Reserve, and transferred to the Third Naval District (Pelham Bay Park) for general detail.

In accordance with the qualifications embodied in paragraph 4, commanding officers are directed to make recommendations to the Commandant, Third Naval District, Detail Office, 280 Broadway, New York, N. Y., of men under their command who are qualified to take this course of training.

TRUMAN H. NEWBERRY,
By direction,
Assistant to Commandant.
—*Our Navy.*

NAVY PLANS AT NEWPORT.—*More Than 20,000 Men Soon To Be in Training There.*—Captain Edward H. Campbell, commanding the Naval Training Station, had with him to-day Naval Constructors Rogers and Williams of the Bureau of Yards and Docks, looking over Coddington Point in view of vast additions to the station to be in readiness when the land is purchased by the navy. Provision for this is included in the Naval Appropriation Bill and Newport is giving $50,000 toward its purchase. With the addition, more than 20,000 men will be under training, perhaps more.

The station will be connected with Coddington Cove by a large steel bridge. Other lands about Coddington Point may be bought by the navy for training purposes.—*N. Y. Times,* 9/6.

Personnel amendments by the Senate Committee to Naval Bill provide: That members of the Dental Corps may attain the rank as high as commander and pay as high as captain; that state naval volunteer forces of 17,000 men be transferred to the Naval Reserve; that the commandant of the marine corps receive the rank and pay of a lieutenant general in the army and that the marine corps also have one major general permanently and two for the perior of the war.

40,000 MORE MEN FOR NAVY.—Upwards of 40,000 men will be needed to man the great fleet of warships which the United States will turn out during the next fiscal year, the House Naval Committee was advised to-day by Secretary Daniels.

In asking the House to concur in the Senate amendment to the Naval Appropriation bill increasing the navy's enlisted personnel from 87,000 to 131,485 men, Mr. Daniels transmitted letters from Admiral Benson, chief of naval operations, and Rear Admiral Palmer, chief of the Bureau of Navigation, showing in detail why this increase is necessary.

The correspondence revealed that new warships are being turned out faster than they can be manned with the present limited personnel, and that should there be a change of naval tactics and the nation be forced to a defensive instead of an offensive fight the navy would be seriously handicapped in handling the fleet against the enemy.

Admiral Palmer said in his letter that a shortage of officers of higher grade should be made up, pointing out that American destroyers now are operating in the war zone without a designated commander other than the British officer, Admiral Bayley. The submarine-chaser force in foreign

waters is commanded by a captain, the admiral said, whereas there should be at least one rear admiral and preferably two for this force.

The two American divisions of armored cruisers also are without a flag officer and there is no flag officer for the division of superdreadnoughts which will be added to the navy within a year. Admiral Palmer also pointed out that the admirals and vice admirals in command of American fleets should have rear admirals as chiefs of staff.

"Merely to man our fleet properly and to make our war organization efficient," Admiral Palmer's letter said, "we must have immediately 27 additional rear admirals, and by July 1, 1919, six more, in addition to those we have now."

Admiral Palmer said that specifically 42,146 men will be needed to man the warships which will be turned out during the next fiscal year ending July 1, 1919. This force he divided as follows: For battleships, 4400; destroyers, 29,992; patrol boats, 5400; seagoing tugs, 3705; submarines, 1026; fleet fuel ships, 1070; gunboats, ammunition ships, etc., 553.

On last April 1, he wrote, 83,475 men were required for the permanent navy, as follows:

On battleships, 33,486; cruisers and monitors, 18,590; gunboats, 3228; destroyers and torpedo-boats, 8234; supply vessels, 5304; naval transports and hospital ships, 2506; tugs, 1000; yards, stations, hospitals, radio stations, 6000; submarines and tenders 5037.

With a force of 131,485 men he estimated that there must be a surplus over those actually on duty of 5864 to replace men wounded, on sick or regular leave.—*Baltimore Sun*, 16/6.

NOTES OF THE NAVY BILL.—*Navy Personnel Increase.*—The chief difference between the provision in the Naval Appropriation Bill voted by the House for the increase of the active enlisted personnel of the navy and the amendment of the Senate for the same purpose lies in the fact that whereas the House voted simply for a temporary increase to 180,000 from the permanent strength of 87,000, the Senate amendment first raises the permanent strength to 131,485 and then authorizes a temporary strength of 181,485, and empowers the President, when in his judgment it becomes necessary, to make a further temporary addition of 50,000 men. These authorizations, with the reserve force added, will bring the total enlisted strength of the navy to somewhat above 400,000.

There is some opposition by those opposed to the maintenance of a strong navy when the country is not actively engaged in war to giving the permanent increase, but the lessons of the times point strongly to the necessity for a larger permanent strength than the law now authorizes. Aside from the present war needs, peace will find the United States in possession of a great mercantile fleet and one that will enter the markets of the world in competition for trade.

Promotion of Retired Navy Officers.—The Naval Appropriation Bill now before the conferees contains a provision intended to relieve, to some extent, the hard condition that fell upon those retired officers of the navy who have been called back to active service with the rank that they held when they were retired, although many have attained important positions in the business world. The provision contained in Section 4 of the Temporary Increase Act as amended by the pending bill will make it possible for the President to give promotion to officers in part, at least, commensurate with the duties they are found able to perform. But under the amendment an officer may be appointed temporarily to rank not above lieutenant commander. There is no provision in the bill which meets the position of those retired officers who already have the rank of lieutenant commander and are performing duties of that or higher rank. Several instances of this sort are found in the bureaus of the navy or on important shore duty. There seems to be no good reason why the amendment should not be changed to authorize the President to make temporary promotions to still higher ranks to cover particular cases. The principle that governs

the navy in making promotions is that rank is not to be given as a matter of personal reward, but for the purpose of facilitating command and administration. Objection has arisen to the temporary promotion of officers retired with rank above lieutenant on the ground that if the officer has been permitted to retire with such rank there is perhaps a presumption that he is not fitted for all round duty, particularly at sea. If the government avails itself or might avail itself of the administrative ability of retired officers for duty usually performed by officers of higher grade it would seem that the President might well be authorized, when properly advised by a navy board that a retired officer was capable of performing important duties, to bestow upon him commensurate rank, pay and emoluments. For it is certainly a principle of justice that the government should not take advantage of the position of an officer to require him to render higher duty for smaller pay.

Selective Promotion of Bureau Officers.—The attention of more than one of the bureau chiefs of the navy is upon amendment 54 of the Naval Appropriation Bill. If this amendment becomes law it will in effect apply to officers in the bureaus of the Navy Department the same rules of selective promotion that now govern promotions in the line. It will, of course, be necessary to omit all requirements as to service at sea as a condition of promotion, since in some of the bureaus—naval construction, for instance—no sea duty is required. The contention is made that this provision will result in the advance to important duties of the officers best qualified to fill them; that it will be a strong incentive to officers to make good in all they have to do. The bill is now in the hands of the conferees, and there are so many amendments made by the Senate that some time will be required for its consideration.

Generals and Admirals.—In the Naval Appropriation Bill, H. R. 10854, now in conference, the following paragraph has already met the approval of both House and Senate, except that the clause relating to the Marine Corps is a Senate amendment subject to conference consideration: "That hereafter the chief of naval operations shall receive the allowances which are now or may hereafter be prescribed by or in pursuance of law for the grade of general in the army, and the officers of the navy holding the rank and title of admiral and vice admiral in the navy while holding such rank and title shall receive the allowances of a general and lieutenant general of the army, respectively. And hereafter chiefs of bureaus of the Navy Department, including the Judge Advocate General of the Navy *and the heads of existing staff corps of the Marine Corps,* shall, while so serving, have corresponding rank and shall receive the same pay and allowances as are now or may hereafter be prescribed by or in pursuance of law for chiefs of bureaus of the War Department and the Judge Advocate General of the Army."—*Army and Navy Journal,* 1/6.

OPERATIONS

FORCES IN EUROPEAN WATERS.—The United States now has a large number of first-class battleships "preparing side by side with the best ships of the British Navy for an engagement on the high seas which is expected to occur at any time with the German fleet," according to a statement made in an address here last night by Rear Admiral Albert Gleaves.

"I do not profess to know much of what is going on in the arena of war on the other side of the ocean," Admiral Gleaves continued, "because I am kept busy with my own part of the game, which is the management of the cruiser and transport operations.

"Again, I am limited to narrow lines in the matter of giving out information, and I would not go into details, even if I did know such things. But I believe I am within the limitations of orders when I say that the United States has a large number of first class battleships now preparing side by side with the best ships of the British Navy for an engagement on the high seas which is expected to occur any time with the German fleet.

"I know that our ships now working with the British Navy in making ready for this fight are in the prime of condition and are fully prepared to win the engagement. We have about 150 vessels over there now, and between 35,000 and 40,000 men aboard them."—*Evening Star*, 3/6.

U. S. MERCHANT MARINE

WOULD KEEP AMERICAN CRAFT FROM FOREIGN CONTROL.—Amendments to the shipping act designed to prohibit American vessels, docks, yards and other port facilities passing to the control of foreign interests and empowering the President to prescribe ocean charter and freight rates and to requisition vessels even as small as 20 tons have been favorably reported to the House by the Merchant Marine Committee. Leaders plan to press the measures.

In presenting the committee report, Chairman Alexander said foreign interests had made determined efforts to get control of American ships by offering prices which before the war would have "seemed beyond the dreams of avarice." Most shipowners had refused these offers, he said, but some few "have attempted by every device which legal ingenuity could suggest to evade the provisions of the President's proclamation prohibiting such sales."—*Evening Star*, 16/5.

TRANSFER OF SHIPS.—The Shipping Board adopted a resolution on Tuesday of this week prohibiting the transfer to a foreign flag of any American vessel of more than 100 tons. Foreign governments, or their citizens who have been seeking ships here, will be permitted to contract with American yards for sail craft not larger than 1000 tons.—*Marine Journal*, 8/6.

OUR SHIPPING DEAL WITH JAPAN.—Latest advices show that Japan is to turn over to the United States Government 66 steamers aggregating 514,000 tons dead-weight and that deliveries will begin this month, continuing until June, 1919. These vessels are in three categories, as follows: 24 will be chartered to the Shipping Board for a period of six months; 15 new, or partially built, for which the United States will release one ton of steel for one ton of shipping, will be purchased at a price varying according to delivery, and 27 are to be built in Japan during the first six months of 1919 and purchased by the United States at the rate of $175 per ton. These latter vessels will average about 8000 tons each. For these one ton of shipbuilding material will be released for each two tons of shipping.—*Marine Journal*, 27/4.

GETS NORWEGIAN SHIPS.—*Shipping Board Charters 400,000 Tons of Sailing Craft.*—The Shipping Board has chartered 400,000 tons of Norwegian sailing ships. They will be put into nonhazardous trades, principally with South America, releasing ships for war trades. The sailing vessels will supplant about one-third as much steam tonnage, the difference being due to slower speed. Some of the chartered ships are as large as 5000 tons capacity, and all of them are of steel.

The chartered ships will be allowed to fulfill existing contracts, most of which expire soon, after which they will be directed in their trade according to war needs. Control by the Shipping Board will result in lower rates to shippers and more effective handling of the ships through the abandonment of the "tramp" method of obtaining cargoes. Most of the vessels are in the Atlantic, but a few in the Pacific will be allowed to remain there for trade with Australia and the Orient.

The addition of the Norwegian sailing ships is one of the most substantial increases the American-controlled merchant fleet has received. Previously, all available steamers flying the Norwegian, Swedish, Dutch and Danish flags had been chartered.—*Baltimore Sun*, 23/4.

550,000 IN AMERICA NOW ARE AT WORK TURNING OUT SHIPS.—Less than a year ago there were not 45,000 men employed in American shipyards. To-day there are more than 300,000 skilled mechanics and laborers engaged in building ships and an additional 250,000 employed in making the engines, boilers, winches and other machinery necessary to equip them.

This tremendous expansion by which the United States hopes to put into service a new merchant marine that will rival the trading fleet of any nation in the world has been accomplished in methodical fashion, without any "fuss and feathers," but achieving a result that industry long will regard as one of the most brilliant victories of the war. It has been brought about by the Shipping Board through recognition of the principle that untrained men can become skilled workmen only through competent instruction. One of the first tasks of the Shipping Board, therefore, was the creation of a Division of Education and Training, which has supervised the establishment of training centers and the development of instructors among the foremen and superintendents.

Training of the various kinds of shipbuilders in the yards is accomplished by putting the men to work on production jobs under the supervision of a yard instructor. This yard instructor has full charge of gangs while they are learning. The efficiency of a green gang under training will average about 80 per cent of finished workmen.

The first training center was established at Newport News. To it were sent skilled mechanics, selected from the yards. They received a six weeks' course of training eight hours a day. During the last part of this course they were obliged to spend 40 hours in the actual handling of gangs of green men. Yard instructors are drawn from a variety of trades, such as riveters, ship fitters, ship carpenters, caulkers, etc.

Twenty-two plants have sent men for training as yard instructors. Two hundred and sixteen of these men have completed their training and 74 are now in training.—*N. Y. Herald,* 10/6.

WE SHOULD ENLARGE OUR SHIPBUILDING PROGRAM.—The man of genius is pre-eminently the man with a strong sense of proportion, and the genius of Charles M. Schwab is certainly marked by this quality. In his particular field of activity he has always shown that he was so deeply occupied with the essentials that he had no time to bother with the non-essentials. His vision has always taken in a wide field, and to this, no doubt, his success is largely due.

It is because he is looking at the shipbuilding question with the same broad vision that he has expressed himself in favor of making a 60 per cent increase in our shipbuilding facilities—*and doing it now!* In urging immediate action, he has in mind the fatal error of last year, when we delayed construction of our more important yards until the good building weather had gone by. The great cost of the Hog Island Shipyard, as we all now know, was due to the fact that its enormous constructive operations had to be carried on in the severest kind of winter weather. So, in his plans for immediately extending the ways in the existing yards, and for the construction of new yards, Mr. Schwab should be able to command the earnest co-operation of Congress, and of everybody else concerned in our huge shipbuilding venture. The enlargements can be made and new yards completed, if we start at once, before the winter weather; in which case, the delivery of steel and the fabrication of the ships can go on without interruption throughout the months of inclement weather.

Mr. Schwab mentioned one important element entering into rapid shipbuilding on a big scale, which we confess has been causing us some anxiety—namely, the building of the engines and the accessories. The demand for these will be simply enormous; and it would be well for the Shipping Board at once to make a fresh inventory of the shops and factories which can do this work, and get them started upon it with the least possible delay.

"The two disturbing questions in this matter," says Mr. Schwab, "are those of fuel and transportation." Well, those questions are up to

Mr. McAdoo and Dr. Garfield; and it is to be hoped that they, as well as the Shipbuilding Corporation, have laid well to heart the lessons of the past winter.—*Scientific American*, 25/5.

CONTRACTS LET FOR 22 STEEL FREIGHTERS.—Contracts for 22 steel freighters, of a total of 204,600 tonnage, have been let by the Emergency Fleet Corporation. The ships will be built at San Francisco and Wilmington, N. C.

The ships will be of the *Isherwood* type. Twelve will be of 9600 tons each and the others 9400. The contracts went to the Union Construction Company of San Francisco and the Carolina Shipbuilding Company of Wilmington.—*Evening Star*, 25/4.

TO LET CONTRACTS FOR 200 MORE WOODEN SHIPS.—As a means of keeping the ship ways throughout the country occupied during the period of the war the Shipping Board announces that it will let contracts for 200 more wooden ships of 4700 tons capacity, in addition to the 200 which it recently was announced would be authorized.

The board decided that further steps to keep the yards busy is made necessary, as so many hulls are about ready to put into the water, also that builders can know just what business they may count on and, therefore, make the necessary preparations for obtaining material and labor.

It is announced also that the board is ready to go ahead with its new determined policy of heavier steel ships; the first of these is to be built on the Great Lakes, of 9600 dead-weight tons, constructed in sections to be transported through the canal locks to tidewater. Contracts will be awarded as soon as the ways now occupied are available.

Charles M. Schwab, director general of the Emergency Fleet Corporation, will go to Detroit next Monday for his first inspection trip of yards on the Great Lakes. He has been invited to speak at the convention of the Associated Advertising Clubs in San Francisco in July, and may go to the Pacific coast at that time.—*Evening Star*, 16/5.

SHIP CONTRACTS FOR $30,000,000 GO TO WESTERN CONCERNS.—*Record of Pacific Coast Company in Output Leads All Others.*—Such splendid progress in shipbuilding has been made in the Pacific Northwest that the Shipping Board has decided to place new contracts there calling for the expenditure of more than $30,000,000.

The board has approved the purchase by the Skinner and Eddy Company, of Seattle, of the properties of the Seattle Drydock and Construction Company, and the first of the new contracts will be placed with that firm, which has been leading all others in the United States in the output of ships.

The Skinner and Eddy Company will expand its present facilities to permit the building of a large number of 8800-ton steel cargo ships simultaneously.—*N. Y. Herald*, 7/6.

FIRST FABRICATED SHIP LAUNCHED.—Launching from the yards of the Submarine Boat Company at Newark Bay of the first of the new standardized fabricated steel vessels for cargo carrying being built by the Emergency Fleet Corporation was announced to-day by the Shipping Board. The new vessel will bear the name *Agawam*, meaning "great salt meadows." The name was selected by Mrs. Woodrow Wilson.

The new vessel, built at yards which have been constructed in the last few months, will have a dead-weight carrying capacity of 5500 tons. The *Agawam* has a length of 343 feet, a beam of 46 feet, and tests are expected to show an average speed of 10½ knots. Fuel oil will be used to generate steam to drive a turbine operating 3600 revolutions a minute. The oil will be carried in compartments of the double bottom of the ship in sufficient quantity for more than a round trip to Europe.

The program of the Submarine Corporation, as outlined by the Emergency Fleet Corporation, of which it, with the Hog Island plant is a part, calls for 150 vessels of the size and type of the *Agawam*.—*Shipping*, June.

FIVE NEW YARDS AUTHORIZED FOR BUILDING CONCRETE SHIPS.—The Shipping Board issues the following:

Five new yards for the building of concrete ships and the construction of a total of 42 new concrete ships have been authorized by the United States Shipping Board.

Of these 42 concrete ships contracts for 18 have already been given by the Emergency Fleet Corporation. Contracts for the building of the remainder will shortly be let. These 42 concrete ships will nearly all be tankers of 7500 tons each, with a capacity of 50,000 barrels of oil. Each of the 7500-ton ships will have 2800 horsepower and a speed of 10½ knots an hour. Others of the concrete ships are cargo ships of 3000 and 3500 tons. The 42 concrete ships will have a total of 298,500 dead-weight tonnage.

Location of the Yards.—The five government yards for the building of concrete ships are to be located at various points on our coasts. The construction of one of these yards at Wilmington, N. C., is already under way. Others of the yards are to be at Jacksonville, Fla., Mobile, Ala., and San Diego, Cal. The fifth yard is that at San Francisco of the San Francisco Shipbuilding Co., which built the *Faith*, the first concrete vessel. This company has been given a contract for eight concrete ships. There are also two private concrete shipbuilding yards, one at Brunswick, Ga., the other at New York City.

Cheaper Than Wood or Steel.—The estimated cost of building a wooden ship is about $165 a ton complete and that of building a steel ship about $180 to $220 a ton complete. The estimated cost of concrete ships is between $100 and $110 a ton complete. The difference is, of course, brought about by the saving in equipment, time, labor, and material. Compared to steel material the saving by the use of concrete often exceeds 50 to 55 per cent. In concrete there is also no waste of material, whereas it is reckoned that the weight of steel ordered for building a steel ship is perhaps 10 per cent greater that than of the steel which is actually used in construction. This loss in steel comes from waste in cuts of plates, angles, rivet holes, and in other adjustments.—*Official Bulletin*, 11/6.

A new American wooden ship construction record is reported to the Shipping Board by the Supple and Ballin Shipbuilding Corporation of Portland, Ore. Hereafter the mark for other wood shipyards to aim at in getting their frames into position on the ways will be 44 hours, as this is the Supple and Ballin achievement.—*Shipping*, 18/5.

SEVENTY-ONE SHIPS OF 344,450 TONS LAUNCHED IN MAY.—Ship Launchings in May, like deliveries, set a new record. Seventy-one hulls, totalling 344,450 dead-weight tons, were put into the water. Thirty-nine of them were steel, with a capacity of 228,750 tons, and 32 wood, of 115,700 tons.

The May launchings exceeded April by 26 ships and January by 55 ships. They also exceeded the highest monthly average of the United Kingdom made in 1913, with a record of 102,931 tons. They lacked only 57,886 tons of equalling the American launchings for the entire year of 1901, the record pre-war year in American shipbuilding.—*N. Y. Herald*, 8/6.

U. S. ARMY

AN ARMY WITHOUT LIMIT.—The report of the Army Appropriation Bill made by the House Committee on Military Affairs, on May 25, falls in with the spirit of President Wilson's Red Cross speech in New York City on May 18, when he asked, "why limit the numbers?" Chairman Dent said on this point in his report: "The committee also has authorized that the authority conferred upon the President by the Selective Service Act be so extended as to authorize him during each fiscal year to raise by draft as provided in the Selective Service Act and acts amendatory thereto, the maximum number of men which may be organized, equipped, trained and used during such year for the prosecution of the present war until it

shall have been brought to a successful conclusion. The appropriation provides during the next fiscal year for an army of practically 3,000,000 men."

The reference to "the maximum number of men which may be organized . . . . and used during such year" is the basis on which we should work in the matter of raising troops to send to France and the only one. It is apparent there is a disposition in the Senate to oppose the granting of any such broad powers as granted in the House report, the Upper House still clinging to the archaic idea that we can have too large an army. That this is a patent and grievous error is shown by the recent experience of the British forces in the German offensive that began with such an enormous display of power on March 21. So resourceful an enemy and one with such enormous resources in man-power as Germany and Austria have proved is theirs must be met with and conquered by more man-power. And the United States is one of the three nations in the world now opposed to the Central Powers that must play a major part if we are to win this war, for the man-power of Japan and China cannot yet be counted on to be called into the balance owing to their geographical remoteness from the battle-fronts of Europe and southwestern Asia.

Through Chairman Dent's report we learn that on May 16 of this year we had a total of 1,605,239 officers and men in the army of the United States. With our population of 110,000,000 this is a trifle more than one per cent of our population. If we add the 3,000,000 men provided for by the Army Appropriation Bill as reported by the House Committee and could put them all in France by the end of this year we still would be making a very poor showing as compared with what Great Britain and France have done. With a population of 39,000,000 France has 4,000,000 men under arms, according to the last statement made by Andre Tardieu, the French High Commissioner. Out of a population of 36,000,000 England had contributed 4,530,000 men according to the figures read in Parliament on January 14. Germany must have had not less than 6,500,000 under arms with a population of 66,000,000. And in Shreiner's "Iron Ration" we read that Germany took 4,000,000 men out of her agricultural industries alone, whereas the United States, according to General Crowder's report, put 105,000 men under arms from this industry in which we have 18,000,000 men engaged. We would have to provide an army of 11,000,000 men to do as well as France and Germany and 12,000,000 to equal England's record. Or to express it in percentages we would have to provide 10 per cent of our population instead of the one per cent we have thus far produced.

No military man deceives himself by underestimating the resisting powers of Germany, Austria, Turkey and Bulgaria. The German General Staff will draw on the man power of those four nations to the limit and then may force the deluded Russians of the western provinces she has conquered to fight for her. Although we have had four years of war there is not the slightest sign of a weakening of the German "will to conquer" on land, in spite of the fact that she has been beaten on the sea even with the aid of the one type of vessel she depended upon when her navy failed her, the submarine. The submarine was counted on to keep the American Army from reaching France in any great numbers in spite of the fact that the submarine did not prevent Canada, Australia and New Zealand from sending 900,000 men to Europe. And this was done in the days when the undersea boats were much more powerful than they are to-day or are ever likely to be again. Our shipbuilding program is reaching such a state of achievement and promise that there can be no question raised of our ability to put millions of men in France. The one thing to do is to provide the men, equip and train them, then send them abroad without thought as to numbers.

Men are force. Force is the only thing the German mind bows to. We are committed to the task of making the Teutonic neck bend to a way of living in the world that will not conflict with our ideals of national

peace and prosperity, of contentment and good fellowship with all our national neighbors. So far as the western front is concerned, from the North Sea to the Adriatic, we present the one real great reserve of force in terms of man power. Let us then put no clogs upon it nor permit any of our representatives in Congress to do so. For this fact remains: It is only by exerting our force in man power now and in the immediate future that we can help to save the world from the living in a welter of blood, depressed under a darkling cloud of oppression and grief, and a terror of Teutonic oppression for long years to come. An American army without limit is the greatest asset on the balance sheet of the peace of the world to-day.—*Army and Navy Journal*, 1/6.

THREE MILLION IN ARMY SOON.—Three million Americans will be under arms by August 1, the Senate Military Committee was told by Provost Marshal-General Crowder.

General Crowder said that 1,347,000 of the 2,428,000 men placed in Class 1 already have been called to the colors. He estimated that some 400,000 additional men for the first class will be secured from the men who registered last June 5 and that another 200,000 will be added by the reclassification of men in the re-examination of the questionnaires now being made.

Extension of the age limits in the army draft will be necessary, General Crowder said, if the present rate of draft calls is continued. He estimated that all the men in Class 1 would be exhausted soon after next January 1.

Requisitions from the draft to complete the 3,000,000 total by August 1, General Crowder said, have been made. Of these 2,000,000 will be draft registrants and the others volunteers and National Guardsmen.

"Everybody thinks there will be heavy calls during the first six months of 1919," was a significant statement made by General Crowder.

General Crowder approved the general principle of the bill introduced by Senator France, of Maryland, extending the registration ages to from 18 to 45 years, thereby providing additional men for military and industrial service. He did not, however, approve the age limits fixed in the bill.

After outlining the plans of the War Department for additional calls, General Crowder said that at the present rate Class 1 will be exhausted by the end of the present year and that unless the age limits are extended and another registration held it will be necessary early next fall to call men in Class 2 and probably soon thereafter in Class 3.

Final figures of classification of the first registration, totaling 8,689,447, were given. The registrants were shown to have been divided as follows: Class 1, 2,428,729; Class 2, 509,666; Class 3, 427,870; Class 4, 3,483,326; Class 5, 1,839,856.

General Crowder submitted figures showing the progress of the draft this year. A total of 1,347,512 men, all from Class 1, will have been called by the end of July, divided by months as follows: January, 23,288; February, 83,779; March, 132,484; April, 174,377; May, 360,230; June, 283,354; July, 290,000.—*Baltimore Sun*, 16/6.

OUR TROOPS TO FIGHT IN ITALY.—Secretary of War Baker implied that American troops would soon be fighting with the Italian forces against Austria in the course of a speech he made in New York City on the night of May 24, at a patriotic concert in honor of Italy-America Day. Mr. Baker's exact words on this point were: "Already there are in Italy as representative of America, Red Cross activities and Y. M. C. A. activities, and a substantial number of American men and women who are cementing the bond between the two peoples by these helpful and humane agencies. The American Government has established there a dignified military mission, and a careful study is being made of Italian methods of warfare. We have already sent to Italy a large number of medical units with doctors and nurses and equipment, and the time undoubtedly is not far distant when American soldiers will take their places with British and

French soldiers at the Italian front, thus making of the army on the Italian front a composite unit, evidencing the community of feeling and unity of effort which is characterizing the activities of the great civilized allied powers on the front in France."—*Army and Navy Journal*, 1/6.

RIFLE AMMUNITION ABROAD.—The War Department authorizes the following statement from the Acting Chief of Ordnance:

The American infantryman in France carries 100 more rounds of rifle ammunition on his person than does the German soldier.

The American carries 220 rounds and carries it with ease in the 10 pockets of his light canvas webb belt and his two bandoleers. The German soldier has only 120 rounds and 30 of the 120 are awkwardly carried in his knapsack, a weak feature since he must lose valuable time securing it at a critical moment.

American webb belts are immeasurably superior to the German leather bandoleers. They are not affected by prolonged rains, nor torrid weather. They are serviceable and efficient in any temperature.

The manufacture of webb ammunition belts is one of the most intricate operations in the textile field. U. S. Army belts are made almost entirely of cotton which is waterproof and will stand almost any amount of moisture and will not shrink or stretch.

The British equipment is of webb. Few realize that this is one reason why, with inferior numbers, they have, time and again, beaten off the enemy. This was demonstrated in the early days of the war, particularly in the retreat from Mons. The large number of cartridges carried by the British soldier, coupled with the cheap cotton supplementary bandoleer system of renewing his supply of ammunition, has served to counterbalance the enormous superiority of German troops in point of numbers on many occasions.

The exact weight of the 220 rounds carried by the American soldier in France is 12 pounds. With the Springfield rifle, 23 aimed shots can be fired per minute. Firing from the hip (magazine fire without aim) 40 shots can be fired per minute. The new U. S. Model 1917 (Modified Enfield) does even better.

Firing point blank into German waves as our troops have done near Amiens, pumping 12 shots a minute, which any average shot can do when aiming at a large mark, an infantryman's ammunition is exhausted in 18 minutes. Assuming that the rapidity of fire of the German rifle is equal to that of the American rifle, which it is not, the American infantryman, because of his webb equipment, is better by 8 minutes and by 100 rounds than the German infantryman.—*Army and Navy Register*, 1/6.

1,568,661 RIFLES PRODUCED FOR ARMY BY ORDNANCE BUREAU SINCE WAR BEGAN.—The following is authorized by the War Department:

Production of rifles for the United States Army has passed the million and a half mark. A report from the office of the Acting Chief of Ordnance, Brig. Gen. C. C. Williams, shows that since the United States declared war against Germany, the Ordnance Department has produced 1,568,661 rifles. These are apportioned as follows:

Model of 1917 (modified Enfields)	1,140,595
Model of 1903 (Springfields)	176,796
Russian rifles	251,270

Equivalent in Spare Parts.—In addition there is the equivalent of 100,000 Enfields, made up in spare parts, and of 100,000 Springfields, made up in spare parts since war was declared. All these rifles and parts, with the exception of the Russian rifles, go into the hands of soldiers destined overseas. The Russian rifles are being used for training purposes and for the equipment of home guards.

Besides the rifles made since war was declared, there are 600,000 Springfields, model of 1903, in use. Only about one-half the soldiers in any army

carry rifles. On this basis the Ordnance Department has enough rifles, Springfield and modified Enfield, for an army of about 2,000,000, allowing wastage for one year.

Daily Average 7941.—Last week's total production was 35,640 rifles, or a daily average of 7941. This figure was reached with only five plants of the eight that have been working on rifles, busy. Higher records were made when all the plants were working in the winter months. Some of the plants have been slowed up on rifles and put to work on machine guns and automatic pistols. Ninety thousand men, women, and children have been engaged in rifle making.

Quantity production of rifles is successful, experts pronouncing the modified Enfield one of the best rifles now made. Tests are being conducted regularly to make sure that standards are maintained. A report received recently from a test at Camp Upton shows that in the firing of 850,000 rounds of ammunition with the 1917 modified Enfields, there were only three minor accidents and practically no malfunctions. Two of the three accidents were caused by the soldiers carelessly sticking the muzzle in the dirt or mud and choking the bore. The Chief of Ordnance has received many other reports from the camps where the 1917 model rifle has been tested, the great majority tending to show the weapon is thoroughly successful.

Caution in Practice.—Precautions have been taken to guard against injury to the new men while they are learning to handle the pieces. There is a pressure of 51,000 pounds on every square inch of the chamber in the United States rifle every time a cartridge is fired. The firing is done close to the firer's face. To guard against danger to the men learning to handle the weapons, a corps of trained men of long experience in rifle firing and instruction were commissioned and assigned as rifle demonstrators.

These officers are equipped with proper gauges and tools to enable them to give the rifles a safety inspection similar to that made of coast and field artillery pieces. With these precautions in force the number of burst rifles at the training camps has been reduced to a small percentage.

Small-Arms Firing School.—Many of the rifle demonstrators and safety experts have been transferred from the Ordnance Department to the small-arms firing school, recently established at Camp Perry, Ohio. Col. John T. Thompson, United States Army, retired, advisory engineer to the Acting Chief of Ordnance, is now recruiting for the Ordnance Department a new corps of trained safety experts. It is hoped that enough of these men will be obtained to enable the department to supply each camp with an officer who can demonstrate the 1917 model United States rifle to all new troops and at the same time teach them how to safeguard themselves against accidents. These men must be above draft age.—*Official Bulletin,* 12/6.

STEAM-DRIVEN 45-TON TANK FOR OUR ARMY.—Our military leaders believe in the soundness of the tank idea.

Designed somewhat along the lines of the now famous British tanks, our own weapon of attack is undoubtedly larger and more powerful than anything yet undertaken in this direction. It is steam-driven, which is quite an innovation, to be sure. While the power of the engines is not divulged, the weight of the huge vehicle is given as 45 tons. Judging from the size, it appears that the tank is heavily armored, perhaps sufficiently for shell fire.

All in all, and in the absence of further information, it can be said that the new tank known as the "America" marks another step forward in the tank method of warfare.—*Scientific American.*

PICRIC ACID PLANTS.—The War Department announced to-night contracts had been let by the Ordnance Department for the establishment of two picric acid plants, one to cost $7,000,000 and to be located at Brunswick, Ga., and the other to cost about $4,000,000 to be located at Little Rock, Ark.

Contracts for the Brunswick plant have been let to the Butterworth Judson Company, of New York City, and for the Little Rock plant to the Everly M. Davis Chemical Corporation.

Men and materials for the construction already are on the ground at Little Rock and the plant will be in operation by September.—*N. Y. Herald*, 25/5.

CONSTRUCTION OF MAMMOTH ORDNANCE PLANT BEGUN.—Work was begun to-day on the $70,000,000 ordnance plant to be constructed for the government by the United States Steel Corporation on Neville Island, in the Ohio River, near Pittsburgh. Army engineers began a preliminary survey of the ground needed for the plant, which, it is said, will be the largest in the world.

Offices were opened in Pittsburgh by John S. Oursler, head of the Newcastle, Pa., plant of the Carnegie Steel Company, a subsidiary of the United States Steel Corporation, who has been selected to supervise the construction of the Neville Island plant.—*N. Y. Herald*, 17/5.

HUGE GOVERNMENT POWDER PLANTS OPEN AHEAD OF SCHEDULE.—*Thirty Thousand Men Will Produce Explosives for Use of America Against Huns.*—The two government powder plants, costing $120,000,000, which have a combined capacity greater than that of all the private plants in the United States, have begun operation, the War Department announced to-day, two months ahead of schedule.

The Nashville (Tenn.) plant started a week ago, and Daniel C. Jacklin, director of the explosive plants division, reported to the Assistant Secretary of War, Benedict Crowell, that the plant at Charleston, W. Va., started to-day.

About 35,000 men worked on the construction of the plants and about 30,000 will be employed in the actual production of powder.

The two government plants are beginning with the production of sulphuric and nitric acids, constituent parts in the manufacture of smokeless powder.

The War Department started preparations in the middle of January. As soon as sites were chosen it was found necessary to build a new town on each site to house the employees. Approximately 9000 different buildings were erected.

Streets were put down and sewered, powder plants constructed, and stores and hospitals erected. When the task of building the plants were considered at the War Department last January, it was predicted that the production of powder might begin in August.

The War Department also announced to-day that contracts have been made with the Air Nitrates Corporation for the construction and operation of nitrate plant No. 3. The two half-units of this plant will be located, one near Cincinnati and one near Toledo, Ohio.—*N. Y. Herald*, 12/6.

THE ARMY TRANSPORT SERVICE.—Frequent inquiries have been made regarding the army transport service and there is an unfounded belief abroad that all of its functions have been taken over by the U. S. Navy. The fact is the army transport service as a branch of the embarkation service under the director of purchases, storage and traffic has grown steadily as well as rapidly since the entrance of the United States into the war, and has at all times retained its status as a branch of the army. A certain percentage of the ships which have been acquired by the service have been turned over to and are under the command of and manned by crews of the navy. The most notable ships in this class were the fleet of German merchant ships taken over at New York and other large seaports in the United States, and each of these ships is manned by the U. S. Navy and its naval reserve force. Only one of the former fleet of transports which were in commission as such prior to the entrance of the United States in the war is in the overseas service. The officers and the crews of

the army transports which were in the service prior to April, 1917, have been retained, and the ships which were running between the Pacific ports and the Philippines and the Atlantic ports and Panama have made their runs regularly and remain under the supervision of the army. The growth of the embarkation service and the requirements for additional officers and crews have been met without serious difficulty, and the efficiency of the service has been maintained in a manner which has been favorably commented upon by officers of the navy as well as the observers who have been sent to the United States by the allied powers to study American methods.—*Army and Navy Journal*, 1/6.

MISCELLANEOUS

THE COAST GUARD BILL.—That bill for the promotion of officers of the United States Coast Guard, while engaged in naval service, which the *Marine Journal* has advocated, has been favorably reported by the Naval Affairs Committee to Congress. We hope and believe that it will be enacted at the present session—for the justice of the measure is apparent to all men.

It is well known that officers of the coast guard, as a rule, have very much more constant and exacting sea service than officers of the navy. The value of the educated coast guard personnel is highly appreciated by the Navy Department. Coast guard cutters armed and equipped for the work are performing active service in the war zone. Their commanders and all coast guard officers will be properly advanced in rank by the new law, on the same basis as officers of the navy.

In a letter accompanying the favorable reporting of the bill, Admiral Palmer, Chief of the Bureau of Navigation, declares that, "In order to utilize the long experience of these coast guard officers, it is necessary that they be given a rank commensurate with their experience." "The coast guard is now a part of the navy, and unless we can have means of utilizing its experienced officers as a part of the navy in their proper positions relative to all other officers of the navy, then the original legislation which placed it under the navy will, to a great extent, be nullified. The coast guard, for the period of the war, has lost its identity entirely as a separate organization. Its officers and men are considered as much as a part of the navy personnel as the officers and men of the reserve force of the regular navy are and are assigned to duty accordingly." Admiral Palmer finally emphasizes the fact that the bill is "entirely for the best interests of the naval service."

Recognition of this fact has been too long delayed by the national lawmakers. The nation has an important asset in the seasoned officers of the coast guard service, and they are equally deserving to receive the proportional advancement which the war has brought to the officers of the regular naval establishment.—*Marine Journal*, 11/5.

A JUSTIFIABLE WAR MEASURE.—After reading an article in the *Saturday Evening Post*, of June 1, written by a naval officer who evidently knows his subject, having had an exciting experience in the war zone with a crew of "Furuseth Seamen," it inclines one to the belief that no vessel should attempt to carry our troops or cargoes of supplies for them and our allies without being supplied with an enlisted naval crew of seamen, firemen, coal passers, etc., when possible to obtain them, for the reason that naval seamen are amenable to naval discipline, the only discipline that insures the safety of the ship under existing perilous conditions, as the naval rules and regulations make short shrift of insubordination of any character whatever. The commanding officers of merchant ships should also be enrolled in the naval reserve force for the period of the war, which would give them the authority of regular naval officers to enforce naval discipline, irrespective of that congressional outrage perpetrated on the American shipmaster, depriving him of absolute authority on shipboard

on the high seas through the passing of the Seamen's Bill, which has brought about disastrous conditions.

Admiral Palmer, U. S. N., Chief of the Bureau of Navigation, quoting from the reports of naval officers and armed guards of experience in the war zone, testified before Congress as to conditions obtained on board ships manned by the seamen's union men as follows:

"If any members of the engineer force decide that they do not care to go on watch they cannot be made to do so. The only recourse in this case is for the engineer officer to send a representative among the others and obtain volunteers to stand watch. The pay of the men who do not go on watch is then checked, and the men who take their watches are paid from such funds as are checked against the former. As the watches always relieve each other at the meal hour after volunteers have been secured, they then go below and get their meal, and this usually takes them about an hour. As a result they get pay for a four-hour watch while actually they stand a three-hour watch."

This would have been considered mutiny when we were a seaman, and the master would have been justified in shooting the leaders of the act if they would not "turn to" or surrender and submit to being put in irons. And such is none the less mutiny now. But the seaman's act has, under certain provisions, made it possible for the crew to cause even shipwreck through disabling its management; hence, as stated above, the only absolutely safe course to apply in sending vessels through the war zone with troops, munitions and food for our soldiers over there is to man them with naval officers (or merchant officers commissioned in the U. S. Naval Reserve Force) and crews entirely made up of enlisted naval men. When this condition is reached our brave boys of the army and their anxious dependents at home will have the assurance that every possible provision for their safety is in charge of representatives of this government, which is the safest medium because it is the most powerful, and thereby resourceful.—*Marine Journal*, 8/6.

GOVERNMENT TO TAKE CAPE COD CANAL AS FEDERAL WATERWAY.—*United States Will Deepen Channel for Passage of Battleships, Army Engineers Report.*—The United States Government is soon to take over the Cape Cod Canal and dig a 40-foot channel, at the same time widening the waterway so that battleships and large steamships may use it, according to a well authenticated report in maritime and financial circles yesterday.

For some time the question has been under discussion by a board of army engineers and to-day probably their report will be ready to submit to Newton D. Baker, Secretary of War, it was learned from Washington. The canal is a most valuable adjunct to the system of defences of the New England coast, but if deepened it will be far more important. The proposals of many engineers have been to make the canal 200 feet wide at the bottom and 400 feet on the surface.

Major August Belmont, president of the Boston, Cape Cod and New York Canal Company, present owners of the waterway, has since the entrance of the United States into the war insisted upon its use for the transportation of coal to New England at rates much less than the actual cost of getting the barges through the canal as a patriotic measure to save coal.

The canal, wharves, breakwaters, etc., cost the sum of $13,500,000, it is claimed, and since the war its operating expenses have been far in excess of its gross earnings.

The Cape Cod Canal was opened for vessels of not more that 15 feet draught on July 29, 1914. August Belmont started its construction in 1910.—*N. Y. Herald*, 28/5.

AMERICA TO RAISE VESSELS SUNK BY U-BOATS ABROAD.—*Navy Department Takes Over Wrecking Concerns for Expedition to European Waters.*—Under the direction of the Navy Department American salvaging expeditions are to be sent abroad to aid the British and French in salvaging

many of the ships which have been sunk by German submarines in shallow waters off the European coast.

The Navy Department to-day announced that it had taken over three of the largest American wrecking concerns in the country. Out of these, with the facilities already at the disposal of the department, the expeditions will be formed. Large seagoing tugs and scows with the necessary apparatus, cables and diving outfits will be sent to Europe to assist in the work. Salvage outfits also will be maintained on the Atlantic and Pacific coasts.

It is estimated that 500,000 tons of shipping sunk by German submarines in European waters can be salved, and with a small amount of repairing placed in service. The amount so obtained will constitute a definite gain over the submarine. Many ships, victims of the U-boats from the beginning of the campaign of ruthlessness, lie in shallow waters. Marine engineers believe that they have not suffered great damage and can easily be floated. Many of the vessels also contained cargoes of great value, the recovery of which would more than compensate for the expense of raising them.—*N. Y. Herald*, 13/6.

TO LIFT BAN ON WAR DECORATIONS.—A joint resolution authorizing American soldiers and sailors to accept decorations for bravery from the Allies and empowering the President to bestow decorations upon foreigners was passed yesterday by the Senate and sent to the House.—*Evening Star*, 22/5.

INVESTIGATION OF TRENCH FEVER.—Trench fever was unknown to the medical profession before this war. Among the British troops at the front it leads all the fevers as a disabling disease, and stands second upon the list of those which cause the greatest wastage from the fighting-line. The British Royal Army Medical Corps have been unable to make a sufficiently exhaustive study of the causes of the disease on account of the scarcity of physicians, and the American Red Cross has undertaken a survey based on the yellow fever investigation in Cuba. This, we are told, is the only American research which has so far been undertaken with the object of saving man-power at the front. The two specific problems placed in the hands of the American investigators, according to a statement sent out from Red Cross Headquarters in Paris, are: "First, the method of transmission of the disease with particular reference to the louse as a transmitter; secondly, to repeat the investigations of a surgeon of the British Army Medical Corps, which have shown that the virus or organism causing the disease is situated in the red corpuscles of the blood and is not filterable, that is, it cannot be caught in any of the filtering processes now employed in bacteriological research." The work is being conducted with painstaking thoroughness in this manner:

"The sixty Americans selected for the experiments are now quartered at a British Base Hospital in northern France under the supervision of a small staff of American army surgeons. The Red Cross has provided walled hospital tents of the latest design for the accommodation of the volunteers, laboratory assistants, and clerks, and transported to the British hospital a complete and extensive laboratory equipment to permit the most accurate and minute study of the disease with reference to infection through parasites.

"For purposes of experiment and observation, the detail of 60 volunteers has been divided into 11 detachments and these assigned to four tents in the British hospital enclosure. Two of the tents contain 10 men each and the other 20 each. These men, who have so unselfishly given themselves as human subjects, are now serving in specified detachments either as hosts to normal or infected lice or have received injections of blood taken from soldiers suffering with trench fever."

The disease thus being investigated by the help of these volunteer victims is further described:

"While trench fever is not fatal in its effects and leaves no permanent disabilities, a soldier entering a hospital with this affection is more than likely to be absent from his command for a period of from six to eight weeks. This extended absence is what has made the disease so alarmingly destructive of manpower at the front. Not only has it prevailed in northern France; it has been reported in the armies in Saloniki and Mesopotamia, and, apparently, a similar affection has appeared in the German forces. Evidence has also been given of individuals contracting it in England.

"It was during the latter part of 1915 and in 1916 that the disease became gradually to be recognized as a distinct, specific infection. The first cases to appear were of a comparatively mild form and disabled the patients for only a brief period. However, in the development of the disease the time a soldier is kept away from his command has been materially increased by reason of the many relapses which occur in the majority of cases. In France the disease has especially occurred in those who have been in the trenches or have cared for the sick in the hospitals.

"Trench fever appears particularly in two types: one, in which there is a short, evanescent fever lasting from a few days to a week and frequently followed, after a few days, by a single short relapse; and another, in which there is a series of relapses. As a rule the onset of the fever is sudden and characterized by headache, dizziness, pain in the back and particularly in the legs, and a sharp rise in temperature, usually to 102 or 103 degrees. Pains in the shins is a common complaint by patients and is often very distressing. The pulse is usually in the neighborhood of 100, and the heart is normal in the early stages of the disease. Disordered action of the heart is very common after the severe cases.

"Diagnosis is often difficult and treatment is dependent upon symptoms. Aspirin and morphin relieve the pain but seem to exert no influence upon the course of the disease. That it is infectious has been demonstrated by medical experts of the British Army through transmission of it to healthy men by injection of blood taken from patients during the acute stage of the affection."—*Literary Digest*, 25/5.

BOOKS FOR ALL MEN IN U. S. SERVICE ARE PROVIDED BY THE LIBRARY WAR SERVICE OF THE AMERICAN LIBRARY ASSOCIATION.—At the request of the War Department Commission on Training Camp Activities, the American Library Association has undertaken to supply reading matter to the men of our army and navy, wherever they may be.

This service extends to large camps, to small camps and stations, to vessels, hospitals, transports, and overseas. It is the aim of the service to send books to every point where U. S. soldiers, sailors, and marines are stationed.

During the last seven months, the Library War Service Headquarters at Washington reports 1,271,800 books shipped to 39 large camps where there are trained librarians and 36 library buildings; 185,000 books to 211 small military camps, posts and stations; 130,000 books to 111 naval stations; 30,000 books to 111 vessels; 20,000 books distributed among 81 army and navy hospitals; 200,000 books shipped from dispatch offices for use on transports and overseas.

This distribution makes a total of approximately two million gift books in service through nearly 600 different agencies. In addition to these, 350,000 new books (largely technical) have been purchased and are in use.

Books and magazines of all kinds are available: good stories; technical books on military tactics, electricity, machine shop work, trench fighting, aeronautics, automobiles, gas and such subjects; poetry; biography; books about the war; in fact, all books that men like to read.

Books will be found in A. L. A. camp libraries, in Y. M. C. A. and K. of C. huts, in charge of Red Cross secretaries and chaplains, in hospitals, barracks, mess halls, on ships—wherever U. S. army and navy men are in service.

If there are no A. L. A. books in any place where men are stationed, all that is necessary to obtain them is to send the following data to the Library War Service Headquarters, Library of Congress, Washington, D. C.

Name and address of camp (or vessel).
Kind of camp (or vessel).
Approximate number of men in camp (or on board).
What agencies are supplying reading matter and to what extent?
What local library, if any, is co-operating?
How many and what kind of books are needed?
How many magazines are needed.
Where will reading matter be housed?
Who shall be notified when books and magazines are shipped?
Will he arrange for the circulation of this reading matter throughout the entire camp (or vessel)?

There is no red tape about getting the books; men in charge will be asked to keep simple records, instructions for which are furnished with each library.

ORDNANCE AND GUNNERY

NO SHIPS TO HAUL NEEDED MINERALS FOR EXPLOSIVES PROGRAM.—A new angle of the shipping problem was presented to the Senate to-day when the Senate Committee on Mines and Mining took up the problem of a mineral shortage due to the lack of shipping facilities.

Advisers of the War Trade Board have stated to the committee that there is great danger of the explosives program of the United States being seriously affected by the curtailment of the importation of minerals. The Senate committee is considering a bill to encourage the production of minerals in this country, but to-day they are endeavoring to secure some definite statement of the probabilities of further curtailment of mineral importations.

C. K. Leith, of the Shipping Board, was before the committee again. He has made a study of the importation of minerals and has recommended the curtailment of tonnage for minerals which have already been made. It is the purpose of the committee to endeavor to secure a working agreement with the Shipping Board that further importation of minerals will not be cut down until Congress has had an opportunity to pass legislation which will bring about a greater production in this country.

It is the hope of Senator Henderson, chairman of the committee, that the supplies of minerals coming from South America can be maintained for a time until production in this country can be assured by the substitution of coastwise vessels for the South American mineral trade.

The bill now before the committee was revised by the House and the appropriation of $50,000,000 asked by Secretary of the Interior Lane was cut to $10,000,000. It appeared to-day that the Senate will be asked to make the appropriation larger than this.

Van Manning, chief of the Bureau of Mines, and independent miners have told the members of the committee that larger sums are needed in order that the explosives program of the United States may be carried out without any shortage of minerals.—*The Star*, 5/6.

THE SHOTGUN'S DEBUT AS A MILITARY WEAPON.—One war suggestion which has been put through in record time is the shotgun. For experts and soldiers at various times have urged the employment of the repeating shotgun both for our aviators and our infantry, ever since we entered the war; and now General Pershing's men are using a military shotgun.

The new weapon is a comparatively short repeating shotgun of the pump-action type, holding six shells in its magazine. Each shell is of the paper kind such as is used in sporting shotguns, and contains nine pellets of No. 00 buckshot, or about the size of a .32 caliber bullet. When fired

the new American gun sprays the contents of each shell over an area measuring nine feet horizontally and about three feet vertically, so that it is almost impossible not to hit a large number of enemy infantrymen coming to the attack in the typical mass formation of the Germans. As for the penetrating power of the buckshot, it is reported that during a recent test the hail of lead went through a 2-inch plank with plenty of energy left for further damage, at 150 yards from the muzzle.

Courtesy *N. Y. Sun.*

EQUIPPED WITH A BAYONET, THE SHOTGUN HAS NOW BECOME AN AMERICAN ARMY WEAPON.

One of the problems which had to be solved in adapting the shotgun to military practice was that of the bayonet. The shotgun barrel is quite thin, so much so, in fact, that it would not offer sufficient support for bayonet work. This difficulty was overcome, however, by providing the

shotgun with an outer steel coat or jacket which, being perforated and held a short distance away from the barrel proper so as to form an air space, acts as a cooling member while affording rigid support for the bayonet.

The American army shotgun weighs 8¾ pounds, complete with bayonet. It is equipped from muzzle to stock with a leather rifle sling so that it may be slung over the neck and shoulder.—*Scientific American*, 11/5.

GERMAN INVISIBLE GAS.—*General Von Stein's Boasts.*—According to the *Cologne Gazette* and the *Rheinisch-Westfälische Zeitung*, the Minister of War, General von Stein, in his statement yesterday in the main committee of the Reichstag, said that 20,000 wounded in the battle on the western front had already returned to their regiments.

The Progressive deputy, Herr Müller (Meiningen), asked whether an agreement was not possible to preserve open towns behind the front from aerial attacks.

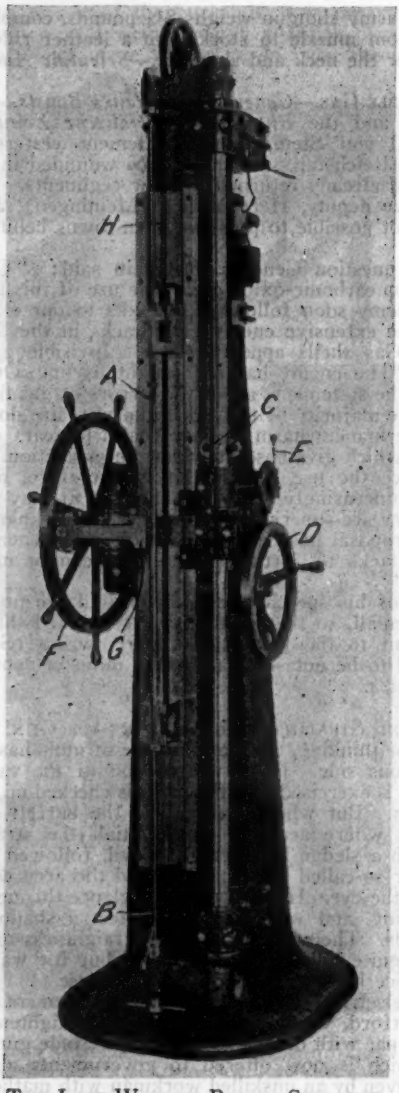
In reply to a question General von Stein said: "Our new sorts of powder all develop carbonic-oxide gas. The use of this gas was organized by us and the enemy soon followed. Thanks to our excellent gas-masks the success of the extensive enemy gas attacks in the Somme battle was practically nil. Gas shells appeared later. Invisible gas is now manufactured by us. The enemy has not caught us up. Our losses through gas are slight. The statements about the terrors of gas fighting are greatly exaggerated. The majority of the sick in hospital are doing well and have at any rate no permanent harm to their health to fear. Our experts have produced masks which give absolutely certain protection. No country will agree to renounce the use of gas. It is, therefore, necessary for our experts to work unceasingly to keep us ahead. It may be said regarding our tanks that they are superior to the enemy's tanks, particularly in speed. So long as no proposal has been received from an enemy government to restrict aerial attacks to fortified towns, we cannot undertake such an obligation alone."

In the course of his speech, the minister said the number of captured Americans was small, so that it might be concluded that few Americans had yet been sent to the front line. Herr Noske (Socialist) said the number appeared to be not so small as the minister represented.—*Reuter, London Times*, 24/4.

CALIBRATING AND STRAIGHTENING MACHINE FOR GUN BARRELS.—To the mechanic's way of thinking, the manufacture of guns has always presented a certain humorous side. In the production of the various components extreme accuracy is exercised, and the work is checked up with a large array of delicate gages. But when it comes to the barrel—the very member above all others where accuracy is essential—the straightening of the bore is done with a sledge hammer and anvil, followed by a crude hand-operated press or so-called straightener; and the accuracy of the work is checked up with the eye. Highly paid men glance through the bore undergoing straightening, and wherever they detect a shadow they apply the aforesaid methods. Their word as to the straightness of the bore is final. All of which is quite ludicrous, to be sure; but for want of some better means this practice has continued in universal use.

By a simple electrical and mechanical arrangement Mr. Charles W. Sponsel, of Hartford, Conn., has placed the straightening and checking of the bore on a par with other phases of high-grade gun production. For his machine, which is now offered to governments and manufacturers, can be operated even by an unskilled workman with mathematical precision. With one day's experience an unskilled workman can straighten barrels within a fraction of a thousandth of an inch, according to Mr. Sponsel. Never before have manufacturers been able to accept specifications calling for the bore of a barrel to be straight within .002 of an inch for its entire length. What is more, the machine permits this phase of the process to be

expedited as never before, thus rounding out the quantity production methods throughout the processes of gun manufacture.



THE LAST WORD IN BARREL STRAIGHTENING IS THIS MACHINE.

The principle of Mr. Sponsel's machine is quite simple, although its application is somewhat involved. It consists of a sensitive electrical apparatus for detecting any slight deviation from straightness in the bore,

and means for applying pressure to the gun at the point of error so that a permanent "set" will be imparted to the metal at this point to bring the barrel into the desired alignment.

Referring to the accompanying illustration, it will be noted that the gun barrel *A* is placed in the machine and held by plugs carried by adjustable brackets. Stretched between the adjustable arms at the top and bottom of the stand is a taut wire *B*, which passes through the bore of the barrel. A V-shaped platinum "feeler" is mounted on this wire and when it comes in contact with the inner surface of the barrel, one of the electric lights *C* is extinguished while the other burns full. Normally, the two lights burn with equal but dim intensity, being connected in series.

Now the platinum feeler is rigidly mounted on the wire, so that the barrel must be moved up and down in order to bring every part of the bore past that point. This is accomplished by the handwheel *D*, and the barrel carrying member is so delicately counterweighted through the chain *H* that the movement is smooth and positive. The position of the wire with relation to the bore can be varied by means of the lever *E*, which serves to twist the large vertical shaft which in turn moves the arms at top and bottom between which the wire is stretched. The shaft is supported on ball bearing, and the lever, operating a screw, completes this delicate arrangement which moves the wire toward or away from the column of the machine. The platinum feeler has its knife edge always pointing toward the column.

In operating the machine the wire is moved until the feeler is almost in contact with the barrel. Then, while the two lights are dimly burning, the barrel is moved up and down the wire by means of handwheel *D* in order to traverse past the feeler. If the lights show no sign of contact, the feeler is brought still closer to the inner barrel wall by means of lever *E*. The distance of the feeler from the barrel wall is indicated by a micrometer dial carried on the screw which is turned by lever *E*. This screw has 20 threads per inch, and the dial is divided into 50 spaces, each of which corresponds to 0.001 inch. At each side of the zero point two spaces are graduated to 0.00025 inch. The process of moving the wire nearer is continued until one of the lights is extinguished, indicating a "high spot."

The straightening operation consists simply of applying pressure at the point where it is needed. This is done by turning handwheel *F*, which in turn forces the hammer *G* down onto the front of the barrel, this hammer being located opposite an anvil with two supporting points on which the gun is held from the back. During this operation the feeler is located midway between the two supporting points, so that the lights indicate when the high spot has been removed.

In reality, the new machine comprises six machines in one, capable of insuring accurate results in the performance of the following operations: Measurement of the bore. straightening of the bore, determination of reamer pockets, determination of eccentricity of outside of barrel to bore, location of sighting mark, and measurement and straightening of bore after rifling. The machine is adapted for use on rifle, shotgun and machine-gun barrels.—*Scientific American*, 18/5.

BULLET VERSUS ARMOR.—*The Familiar Contest of the Sea Started Anew Upon the Land.*—By Edward C. Crossman.—From the day the horrified jackies of our old navy watched their round shot bounce off the armored sides of the *Merrimac*, ballistic sharks and armor experts have striven assiduously to produce the fabled condition of an irresistible force meeting an immovable body. The *Merrimac* was efficient not because her armor was anything but crude railroad iron, but simply because this sufficed to stop the inefficient missiles of the day. A tug with a modern 3-inch quick firer could have stood across Hampton Roads and whipped the hind sights off the poor old turtle-back without taking a scratch.

From that hour to this, and with the end not yet in sight, projectile maker has gone armor manufacturer one better, only to have the other "see and raise" him, with the process repeated in wearisome iteration. And now the

argument has been transferred to land, becoming the case of the rifle and machine gun *versus* the steel shell for men, cars, planes and tanks.

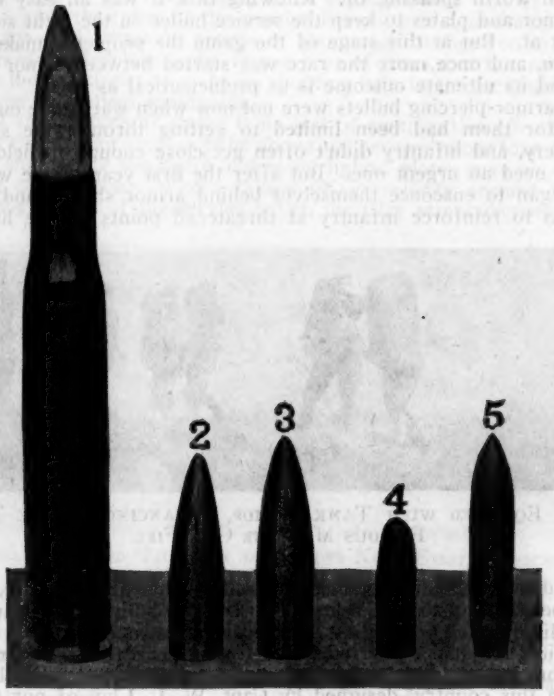
After every war, authorities and near-authorities emerge with a full list of the conclusions drawn therefrom, which are final and admit no argument. Thus the Boer War did away with the bayonet. The British were very bitter about this weapon. What was the bally use, they asked, of a bloomin' bayonet when the bloody Boers didn't even allow them to get close enough to do fair rifle shootin'? And echo answered, "What?" Our M 1903 rifle had a bayonet installed only after much controversy,

STEEL BREASTPLATE WORN BY GERMAN SHOCK TROOPS, SPECIALLY EQUIPPED FOR ASSAULT WORK.

and then only because it could also be utilized as a cleaning rod. As a cleaning rod it was fairly efficient, as a bayonet it was a fair cleaning rod. However, before all the bayonets were beaten into pruning hooks and safety razors, the Japanese got into their Manchurian argument with Russia, and the bayonet hastily came back into its own.

The same optimistic attitude as to the capacities of the magazine rifle that nearly did away with the bayonet was also responsible for the abandonment of any other protection against modern bullets than Mother Earth. The big lead slugs of the 70's and 80's were entirely adequate to

driving through the light armor of the cuirassiers; then the excessive penetration of the Krag and the Lee-Enfield, when these appeared, seemed definitely to put the quietus upon the armor side of the question. It is doubtful that even to-day armor would be revived as it has been, were it not for the many things of lighter penetration than bullets which are flying about our battlefields—shrapnel, shell splinters, grenade fragments, bayonet points. These things made light protection for the head very desirable; this, extended to the body in the form of a light cuirass affair, was then, because of the comparative immobility of the troops, thickened into protection against the bullets themselves, despite the weight thus added.



SOME MODERN RIFLE ORDNANCE.

1. Sectional Clay Bullet. 2. U. S. Service Bullet. 3. The Clay Armor-Piercer. 4. Steel Slug from Clay Bullet. 5. Steel Slug from German Piercer.

At the present time, therefore, we find a second coming of armor for man, gasoline horse and flying machine not equalled since the Middle Ages. The armored tank waddles imperturbably astride of machine gun positions and cleans out the operators therein, it saunters down street in the face of cracking infantry fire. Armor coats the engines and most of the crew of airplanes, it surrounds light motor cars, it covers the head of every soldier of the fighting nations outside of Russia. It has been tentatively taken up as body covering in the form of layers of canvas and steel or of woven steel links. In thickness merely enough to stop the plain infantry bullet, it forms the shield and the apron of every field gun. Most of these things, to be sure, are practicable only while the forces are in a

state of relative deadlock; their weight would hamper troops on the march. But the fact of relative deadlock remains.

Our armored cars are reported to be covered with treated steel ¼-inch thick, which is sufficient to keep out the ordinary bullet. The photograph shows the slight effect in this case. The armor of the field gun is ⅕-inch thick, and turns the service bullet at 100 yards, as proved by the two bullet marks on every gun-shield used in our navy. Our service bullet gets through a scant half inch of mild steel. The special target-shooting pill makes the full half inch; so does the German bullet. But against specially hardened armor steel any of these bullets might merely shatter, with no penetration worth speaking of. Knowing this, it was an easy matter to evolve armor and plates to keep the service bullet on the right side of the thing shot at. But at this stage of the game the projectile maker took a hand again, and once more the race was started between armor and projectile; and its ultimate outcome is as problematical as ever.

Special armor-piercing bullets were not new when war broke out, but the occasion for them had been limited to getting through the shields of field artillery, and infantry didn't often get close enough to field guns to make this need an urgent one. But after the first year of the war, when snipers began to ensconce themselves behind armor shields and armored cars began to reinforce infantry at threatened points of the line, while

ITALIANS, EQUIPPED WITH TANK ARMOR, ADVANCING IN THE TEETH OF FURIOUS MACHINE GUN FIRE.

airplanes demonstrated surprising immunity to machine gun fire, the ordnance experts began to take a keener interest in bullets that would not be so easily discouraged on meeting a stubborn steel plate.

The writer has had the privilege of testing several hundred rounds of ammunition loaded with the most successful armor-piercing bullet yet evolved in this country, designed by Capt. W. L. Clay of our Ordnance Department, and made at Lowell, Mass., under the supervision of Captain Doe, formerly of our army. This bullet (patent number 1202162), in common with most armor-piercing bullets, uses the hardened steel core within a lead and cupro-nickel outer coating. It differs from any other bullet in that it is closed at the rear and filled from the front end of the jacket, giving higher penetration because of the lessened stripping tendency of jacket and lead. Also it has a softer nose than the tough cupro-nickel jacket. This enables it to bite on hardened steel surfaces very much inclined to its path instead of merely glancing off, as does the service bullet with its sharp nose and long shoulder.

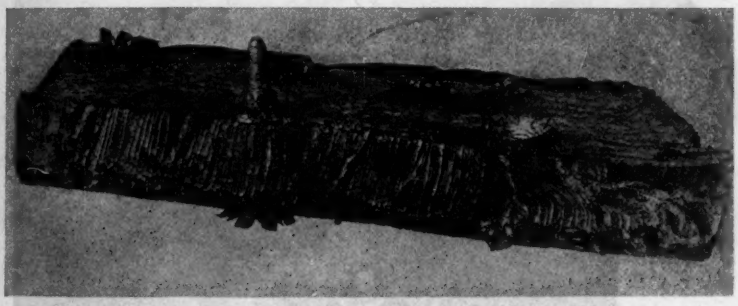
This softer cap may be of lead alloy, copper, aluminum, or any other soft metal. In the case of the samples sent me for trial, it was merely soft lead. Inside is a hardened steel bullet in miniature, too hard even to file, and therefore resisting deformation on steel plates. In the samples it was left rather rounding at the forward end, so that enough of the leaden core would be driven forward, forming a cap to support the hard point and

prevent it from shattering on the hard armor. In the bullet as finally redesigned, this point was made somewhat sharper.

The slug is .75 inch long and .218 caliber—the difference between this and .308, the diameter of the service bullet, being lead and jacket. The slug weighs 45 grains, the complete bullet 150, matching here the bullet of the service cartridge. Outwardly it is of the same form, but about 1/10-inch longer, to give service weight and of course to compensate for the lower specific gravity of the steel core. It feeds readily through rifle or machine gun. The soft point on the sample makes it look precisely like the various soft point bullets for sporting use of the Springfield.

The accuracy of the Clay bullet, while slightly below that of the service bullet, is higher than that of the regular French model, and ample for war use. At 200 yards it makes groups of about eight inches for 10 shots, and at 1000 yards it develops some 10 per cent of fliers, but not enough inaccuracy in the remainder to make its shooting inferior to the regular ammunition from a practical standpoint.

In mild steel, which as stated is no test of comparative effects, the Clay bullet got through an inch—a trifle above 100 per cent more than the service bullet. Lengthening the range and using lighter plates gave an even more favorable comparison. Where falling off in velocity seemed to remove most of the wallop of the service bullet, the Clay armor-piercer continued



INCH STEEL PUNCHED THROUGH BY A SOFT-NOSE SHOT, WHICH IS HELD HALF-WAY OUT ON THE OTHER SIDE.

to get through. At 700 yards against ⅜-inch boiler plate, which the service bullet merely dented, the Clay slug slipped through neatly.

The mild steel developed a peculiarity of the Clay projectile that remains still unexplained. On a piece an inch thick and a trifle tougher than the first sample, slug after slug stuck after getting almost through—pulled up with three-quarters of its length projecting from the back side of the plate, gripped by some action that prevented its final egress. In theory at least, when a steel shell goes through a plate with half its length, finishing the penetration is so much a matter of touch and go that a few yards' difference in range might be expected to put it through, or see it not so far in; but the theory didn't work out. Altering the range 50 yards or so altered the phenomenon not a particle. At 750 yards some of the slugs stuck even in the comparatively thin ⅜-inch plate. This stubborn refusal to go clean through seemed to demonstrate either a welding effect, or else a wedging of the steel in one direction by the slug head, and then a closing up on the body before the slug finished penetration. A trial with a cupped point of full diameter of the slug *à la* drill should throw some light on the matter.

On hardened steel, as near armor specifications as we could obtain, the effect of the piercer bullet was even more marked. At the muzzle it romped through ¼ to ⅜-inch hardened steel, on which the service bullet merely

spattered; at 400 yards it got through ¼-inch, though this was possibly not quite up to government quality. The trials demonstrated that the making of steel for this light armor is in itself a ticklish job. One piece, ¼-inch thick and glass hard, shattered to bits under the bullet's blow. On such steel as this the service bullet does not even offer to go through, merely putting a wide and very shallow dent in the plate; it gives just a blow, without drilling tendency. This is true even on the light ⅕-inch field-gun armor.

I am satisfied that at 500 yards the Clay bullet will get through the present shield and apron of our field gun, and that at 300 yards it would ruin our tanks with their quarter-inch protection. The light shrapnel helmet stops it at long range, and so does the airplane armor; but the bullet will go through the former at 2000 yards and through the latter at 1000. The British tanks are very heavily armored, and it is doubtful if even this type of bullet will go through.

The Germans are not behind us in the development of armor-killing projectiles. Before me lies a German piercer bullet from the Ypres salient, with which a sniper was killed through a quarter-inch of armor

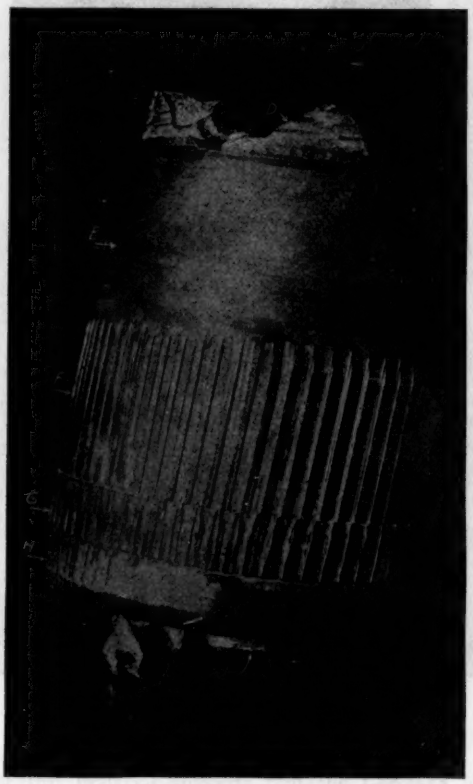
STEEL CORE BULLET THAT DID NOT QUITE GET THROUGH; BASE SHOWN EMBEDDED IN THE HOLE.

steel. This is a whale of a bullet, far too long to feed through the magazine of a rifle or machine gun without some change of parts. It consists of the usual hardened steel slug, leaden wall, and surrounding steel jacket; but the slug alone is as long over all as our complete service bullet, weighing 86 grains against the 45 of the Clay slug. It is very sharp pointed, although the taper is not long; and it is boat-shaped, having a tapering tail of only .20 inch. While it has hit steel, so that the lead core is nearly all missing, the fragments remaining weigh 147 grains, giving a mass around 200 grains for the finished bullet.

This elephantine piece of ammunition is without doubt a terrific drill for armor, probably more so than the Clay Bullet. But it has the serious drawback that it is not at all adapted to work with the regular ordnance and its ballistics will be a thing apart, where the Clay bullet shoots to the sight graduations on our rifle and machine guns. It is apparently used in special rifles for snipers, resighted for it, or in special machine guns altered to handle the long cartridge—perhaps in both. Even though the infantry rifle were made to chamber it, it would not shoot to the sight markings, either the vertical ones or the lateral zero.

The one general objection to all these armor-piercing bullets is that, after completing peneration, they are reduced to tiny steel shot of .218 to .24 caliber; the remainder of the bullet disappears into thin air on impact with the steel. The wounding power of a steel slug of such size and weighing but 46 grains is less than that of the familiar .22 long rifle, in spite of the advantage in velocity at the short ranges. But in spite of this, these bullets will greatly reduce the enthusiasm for steel bullet stoppers; even a .218 hole in one's anatomy is more discouraging than none at all.—*Scientific American*, 1/6.

THE SEVENTY-FIVE-MILE SHELL.—The recovery of additional fragments of the shells which have been reaching Paris from behind the German lines, makes it possible to produce a drawing which shows the shell with a close degree of accuracy.

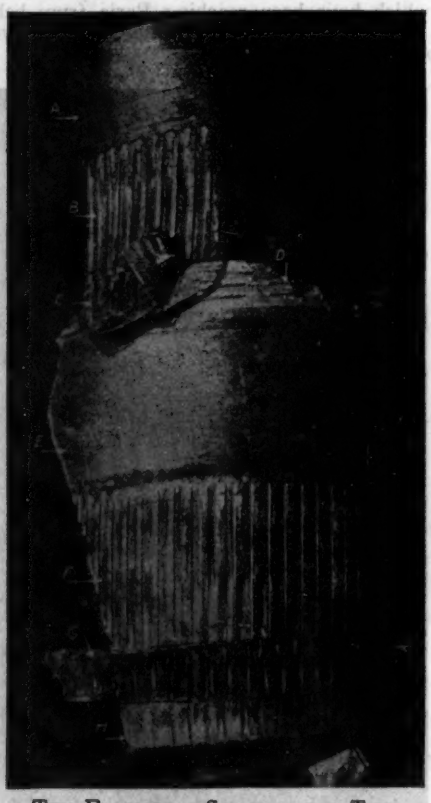


THIS FRAGMENT SHOWS CLEARLY THAT RIFLING IS MACHINED INTO THE SHELL.

There has been some discussion as to whether the curious parallel lines, scored deeply into the outer surface of the shell, were rifling that had been machined into the shell in the shops, or were merely the result of an upsetting of the wall of the shell forcing it against the rifling and causing it to become deeply scored. This effect has been observed in shrapnel whose walls have been made too thin, and it is a defect against which the inspectors at the proving grounds watch with very close attention. The

upsetting, of course, is due to the inertia of the shell and its charge, causing the walls to bulge and bear heavily against the rifling.

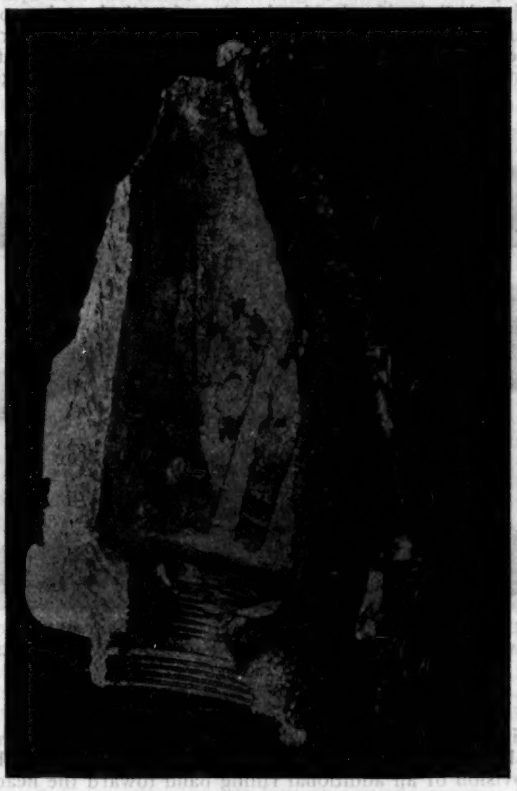
The group of three photographs showing two unusually large fragments of the shell, and the other group showing some smaller fragments, tell their own story. The first group establishes beyond any doubt that the shells are formed with two separate sets of rifling, each with its own copper band behind it. The center photograph of the three gives us a view of the shell proper for its full length exclusive of the false nose or windshield. At *A* and *E*, the shell has been turned down to a diameter



TWO FRAGMENTS SHOWING THE TWO SEPARATE RIFLING BANDS.

slightly less than the base of the rifling in order to allow the grooves and lands on the shell to engage freely those in the bore of the gun. At *B* is the forward rifling, and below it is shown, at *D*, the face of the groove, and at *C*, a portion of the rifling band. At *D* will be noticed a series of interrupted raised ribs, whose purpose is to prevent the band from slipping, either circumferentially or in the direction of the axis of the shell. At *F* is a section of rifling, somewhat longer than the forward portion; below this is the second rifling band *G*, and below that, the base of the shell *H* and *J*.

Now, referring to the group of smaller fragments, which shows three views of each piece, we have at the left a fragment of the wall of the shell, then the fuse plug at the base of the shell, and next the central diaphragm with a raised boss at the center, threaded to take the second fuse plug which is seen in place. This diaphragm is threaded on its periphery, and perforated. To the right is a fragment of the wind-shield at the nose of the shell.

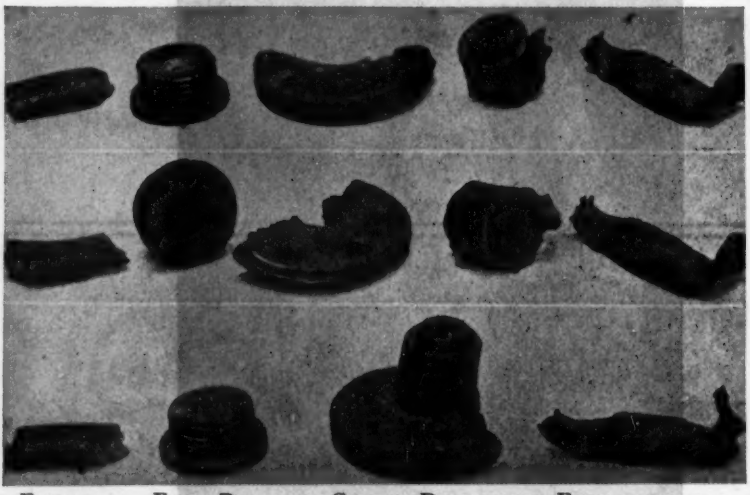


INTERIOR VIEW OF BASE OF SHELL SHOWING SEATING FOR FUSE PLUG.

A study of this material suggests that the Germans have had some trouble in two particulars. First, in securing the proper detonation of the shell; and second, in obtaining the enormous velocity of rotation which is necessary in a flight whose duration is about three minutes. Why two fuses should be necessary is puzzling, unless indeed the shell-filler has had to be made so inert against shock as to call for such provision. This, however, is not all probable, and it seems to us that the two fuses are used merely to make it doubly certain that the shell will be exploded—if one fuse should fail to function the probabilities are that the other would.

The detonation of the whole charge is made certain by the holes in the diaphragm through which, of course, the flame of explosion would pass to the other chamber.

It will be remembered that, in a previous article, we stated that the speed of rotation of projectiles may vary all the way from 4000 to 20,000 per minute, depending upon the caliber. In the experimental work which the Germans must have done to secure a reliable gun, these fragments seem to show that they had trouble with the copper rifling bands; for nothing less than this would have caused them to return to the long-abandoned practice of providing rifling or studs, or other equivalent, on the face of the shell itself. Evidently, they found that the copper did not provide sufficient resistance to withstand the shearing and stripping effects of the inertia of the shell against rotation. The fact that the scoring on the band does not register with the rifling on the shell, suggests that the



FRAGMENT OF WALL OF SHELL. FUSE PLUG AT BASE OF SHELL. CENTRAL DIAPHRAGM AND SECOND FUSE PLUG. FRAGMENT OF THE WIND SHIELD AT NOSE.

SHELL AS SHOWN BY FRAGMENTS

former slipped in the groove; although it is possible that this movement may have been caused by atmospheric resistance after the shell left the gun.

The provision of an additional rifling band toward the head of the shell is something novel. At an earlier period in the development of ordnance, a band was placed at this point, but its function was to act merely as a centering or bearing band to maintain the shell in its true axial position in the bore. In this case, however, the Germans have used it as a rifling band and additional gas check. It would serve as a check for such gases as may have forced their way past the rifling band at the base.

In summing up, it must be admitted that in this new venture the Germans have contributed more to the entertainment of the public and the awakening of curious interest of technical men than they have to the science of ballistics and the art of gun construction and they have done this at the cost of drawing up another eternal indictment against themselves as a people unimaginably ruthless and cruel in their treatment of the civilian population.—*Scientific American.*

LONG-RANGE ARTILLERY CALCULATION.—By Sir George Greenhill.—Recent events have directed attention forcibly to the importance of long-range calculations in modern warfare, in opposition to the old-fashioned traditions of intellectual timidity and rule of thumb; and it is little consolation to the citizens who suffer under a distant bombardment to be assured it is of no military value.

Formerly the gunnery problem was presented to the student of theoretical artillery from a point of view the reverse of what is important to-day; from the data of given ballistic power of the projectile, and given muzzle velocity and angle of projection, he tried to calculate the range over a horizontal plane, the time of flight, angle of descent, striking velocity, and further, some subsidiary effects, such as drift from the vertical plane of fire; also the probability of hitting a target of given size.

In the field these details would be presented in a different order. The range would be given and then the requisite elevation looked out from a range table of the gun required to obtain this range, the ballistic power of the gun being given.

The old gunner preferred to make his own range table, based entirely on his practice, heedless of theory; but this method became too expensive with modern weapons, and ink was made to serve instead of gunpowder to a greater and greater extent in drawing up a range table, as more economical and equally trustworthy. But in our recent experience these conditions are reversed completely, and the former order of calculation requires to be turned round and inside out, and the problem considered in the reverse of the historical order. Suddenly we find one day the enemy shell begin dropping on us from the sky, and we cannot imagine whence they come, and calculation is our only guide.

Fragments pieced together tell us the caliber of the gun and weight of the shell. The slant of the hole made on impact in the ground gives the angle of descent, and the depth of the hole and other destructive effects are measures of the striking velocity. Working backward from these estimates, however rough, of the ballistic power of the shot, the striking velocity, and the angle of descent, and with the resistance of the air reversed in direction into an assistance, the usual calculations of long-range fire will determine ultimately the initial velocity, angle of projection, time of flight, and range of the shell, and then the gun is located within narrow limits, on the direction of the line of fire, corrected for drift and rotation of the earth. Because in a time of flight estimated at so great as 2½ minutes, the influence of the earth's rotation is quite appreciable. It is calculated on the theory that the vertical plane of the trajectory remains fixed in space, as in the Foucault pendulum, and keeps pointing to a star near the horizon, rising or setting, while the horizontal plane on the earth is turning round at a horary rate of 15° at the pole, but 15° sin. lat. elsewhere; that is 15′ sin. lat. per minute of time (sidereal), or 0.25′ sin. lat. per second. Thus in 2.5 minutes, and in our latitude, the horizontal plane of the earth will have revolved about half a degree past the plane of the trajectory, and a deflection of 30′ must be given on the sight, against the sun, widdershins. In 75 miles, or 120 km., this would account for about 1 km. of deflection on Paris. The drift, too, of the shell fired from a right-handed rifling would require to be corrected by an additional deflection of considerable, but unknown, amount, in the absence of an exact theory of drift, and determinable only by experiment. The total deflection reversed would be applied to the apparent line of fire into Paris, in locating the gun.

Acting on these preliminary instructions, our airmen will soon locate the enemy gun with accuracy, and endeavor to bomb it out, the target being too small to reach with distant gunfire. Meanwhile, our artillerists must set to work to make up lost ground, and strive to produce a rival weapon of equal power, capable of imparting the requisite muzzle velocity to the shell of given weight; and here all the resources of calculation of internal ballistics and the theory of gun construction are required,

before the gun can be designed and then put in hand in the workshop, everyone working hard against time. Any method of scientific procedure, however rough and ready, will be useful in saving time, and acting as a check on more refined calculation, and so we proceed to describe some such methods, given already in the writer's "Notes on Dynamics," for the use of the officers of the advanced class of the Artillery College, 1908, §78, page 99.

As stated there, "The parabolic theory of Galileo, although ignoring air resistance, is able to assign limits between which the real trajectory will lie in a resisting medium. The range X is supposed given, and the angle of departure and descent, α and ω; and then the real trajectory must lie between the two parabolas on the range X, with angles of departure α and ω, and equal angles of descent. The height h of the real trajectory lies between the height of the parabolas, so that $\frac{1}{4} \times \tan \alpha < h < \frac{1}{4} \times \tan \omega$. The time of flight T is intermediate to the parabolic times of flight,

$$\sqrt{\frac{2X}{g}} \tan \alpha < T < \sqrt{\frac{2X}{g}} \tan \omega.$$

And if V, v, denote the muzzle and striking velocity in the real trajectory,

$$V > \sqrt{(g X \operatorname{cosec} 2\alpha)} > \sqrt{(g X \operatorname{cosec} 2\omega)} > v, \text{ ft./sec.}$$

The least parabolic velocity to give the range is $\sqrt{(g X)}$, and then $\alpha = \omega = 45°$; and with a range of 75 miles, $X = 396{,}000$ feet, and $\sqrt{(g X)} = 3200$ feet per second, a velocity attained by Andrew Noble in his experimental 6-inch 100-caliber gun, using a charge of 27.5 lbs. of cordite, with a shot of unspecified weight, but probably 100 lbs.

The height attained would be one-quarter the range, say, 19 miles, and the time of flight 157 seconds, a little over 2½ minutes.

The actual time of flight has not yet been recorded, but we may assume for our argument that it was 2.5 minutes, making the average velocity over the ground for the 75 miles equal to 30 miles a minute, 1800 miles an hour, 2640 feet per second. Suppose, then, we imagine a shot flying horizontally with this velocity, 2640 feet per second, 20 miles high, and calculate its history before and after.

At this height, and for a considerable distance lower, air resistance may be ignored in the absence of any appreciable atmosphere, although enough, as we see, to fire the meteorite; so we begin by calculating the advance of the shot on the parabolic theory while it has risen or fallen, say, 15 miles, before or after; and is still some 5 miles high above the ground. The time occupied in each of these movements will be about 70 seconds, so that the total horizontal advance is 70 miles.

We may suppose this parabolic trajectory raised on stilts 5 miles high, out of the region of appreciable air resistance, and then draw the supporting stilts at each end as the initial and final part of a real trajectory in the resisting air, first in a free-hand sweep to give some notion of the extra range at each end. The sweep of the curve must be flatter than the parabola and outside at the gun end, but inside and more curved where the shot is falling; and these are the two parts to be examined with greater care and attention to the dynamical equations with air resistance. The effect is to reduce the angle of elevation below 45°; but it is probable a greater elevation is given, say, 50°, or even 55°, to clear the lower dense strata, as pointed out in the "Text Book of Gunnery," 1904, page 225.

On the parabolic theory this would make the muzzle velocity greater than $2640 \sqrt{2} = 3735$ feet per second, so we may infer that a velocity is required in the region of 4000 feet per second. Sir Andrew Noble's gun must be lengthened again, by another 25 feet, to 150 calibers, to see if it is not possible to reach and surpass this 4000 feet per second velocity, and so produce a rival to the German long-range gun. Another increase of velocity of some 15 per cent, to 4600 feet per second, should increase the range some 30 per cent, from 75 miles to 100 miles, and then it would be possible to bombard London from Calais, the time of flight being about 3 minutes.

In the opinion of some experts the velocity of the present gun is from 5000 feet to 6000 feet per second, enough, in our opinion for a range of over 100 miles. According to French estimates the initial velocity would be about 1400 meters per second, 4600 feet per second; and the weight of the shell is 100 kg. to 120 kg. This is rather light for the caliber 22 cm., 9 inches, but enables the muzzle velocity to be increased, and the loss of driving power through the air is made up by fitting a long sharp-pointed Spitzer head of sheet iron, making the external appearance very similar to a modern rifle bullet 4½ calibers long. The actual steel shell body is only a little over 2 calibers long, and the bursting charge in the cavity is divided in two by a diaphragm, with the object apparently of preventing a premature explosion during the discharge of the gun.

First accounts described the shell as arriving in two parts, and a theory was advanced that extra ranging power was obtained by an internal explosion about mid range. But as in the sharp-pointed rifle bullet, it is the scientific design of the exterior shape which gives the extra ranging power, with a diminished weight for high muzzle velocity.

The uncertainty in all these calculations of long-range fire is the estimate of air density in the upper strata of the atmosphere, discussed as a whole; a subject much debated in modern meteorology and geophysics.

Two assumptions are employed of this constitution, between which the true density of the air may be supposed to lie: (1) Isothermal equilibrium; (2) Convective equilibrium. These are discussed in the writer's "Hydrostatics," Chapter VII.

On the isothermal theory the temperature of the air is taken to be constant, and then the correction for the density of the air at a height y feet is the tenuity factory $\tau = e^{-y/k}$, where k is the height of the homogeneous atmosphere, taken at ordinary temperature at 27,000 feet, say, 5 miles, but stretching or contracting with variation of temperature like an air thermometer. At this rate $\tau = e^{-1} = 0.368$ at 5 miles high, so that air density and resistance is a little over one-third the value at ground level, and so could not be ignored. Airmen have flown at this height, or nearly. At 10 to 20 miles high, $\tau = e^{-2}$, $e^{-4} = 0.135$, 0.018, still appreciable, although small.

But on the convective theory the temperature is taken to diminish uniformly with the height y, according to the law $\frac{\theta}{\theta_0} = 1 - \frac{y}{c}$, connecting temperature absolute θ with ground temperature θ_0; and $\frac{c}{k} = \frac{\gamma}{\gamma - 1} = 3.5$, γ the ratio of the two specific heats of air, taken as 1.4.

According to this law, the tenuity factor

$$\tau = \left(1 - \frac{y}{c}\right)^{\frac{1}{\gamma - 1}} = \left(1 - \frac{y}{c}\right)^{2.5}$$

and the atmosphere ceases at a height $y = c$, something less than 17 miles; and before attaining this height the temperature would be so low that the air would become liquid and frozen, and the shot would have to break the ice to reach a height of 20 miles. But this is in contradiction to the Twilight effect, or the height of the Krakatoa volcanic dust observed by astronomers. We conclude then that convective theory should not be employed beyond a limited height in the atmosphere.—*Engineering*, 26/4.

RADIO AND NAVIGATION

SYNCHRONOUS SIGNALLING AND SAFETY AT SEA.—Recent developments in connection with methods of signalling between ships and shore stations, as well as between ships at sea, with the object of averting collision, were the subject of the two Tyndall lectures delivered by Professor J. Joly, before the Royal Institution on April 9 and 10.

In the introductory portion of the first lecture, Professor Joly dealt with the difficulties of determining the position of a ship by existing methods. Sailing directions which were still extant indicated that there was no help for a sailor in a fog save fog signals and the use of the lead, and the latter was assumed to be the only safe guide to position when approaching land. These regulations, however, did not imply the general worthlessness of aerial sound signals, and it was not likely that their disuse would find favor with mariners. The purpose of his lectures was to consider additional aids to navigation, whereby the sailor escapes the dangers arising from the failure of aerial fog signals and was supplied with other signals at once more reliable, capable of being received over greater distances, and giving information beyond the power of aerial signals to convey.

Principle of the System.—One of these methods was synchronous signalling, which was based on the use of signals propagated in different media, but timed to start at the same instant, the system depending for its efficiency on the different rates of propagation of the signals. In the existing system of coast signals, which involved the use of light as well as sound, there was no co-ordination, and, as at present ordered, the mariner only obtained a bearing indication, whereas, if the signals were synchronised, they would give not only the bearing, but a determination of distance with sufficient accuracy to enable the navigator to fix his position. There were, however, objections to the use of sound signals passing through the atmosphere. Some arose from the difficulty of receiving them in stormy weather, but a more serious objection was the strange, but, fortunately, not very common phenomenon of silent areas. This curious fact had never been fully explained, although it had been investigated by Tyndall and Lord Rayleigh. It had been found that even when using the elliptic trumpet of Lord Rayleigh, which prevented the vertical dissipation of the sound, mute areas still existed when the necessary conditions prevailed. The most reasonable explanation was that the sound wave followed a sinuous path, rising and again sinking to the level of the sea, and that fact would be a source of error in any calculations of distance based on the velocity of sound in air. Flashlight signals had, of course, the disadvantage of being invisible in thick weather, and only under certain conditions, therefore, was the combination of synchronised light and sound signals of real value. It was desirable, however, that such a system should be developed to assist the navigation of small craft, such as fishing boats and small coasting vessels. The system would be a combination on buoys of a synchronised light flash and bell stroke, and should not be difficult to arrange, as automatic bell buoys, as well as buoys which showed an occulting light were somewhat common round our coasts. The signalling could be arranged, so that not even a stop watch would be required on board a fishing boat or other vessel making harbor, as the intervals between the light flashes could be fixed to represent a cable length or other predetermined distance, and it would only be necessary to count the number of flashes before the bell was heard to determine the distance in cables or nautical miles. The introduction of such a system would be a great advantage to small craft, which were generally debarred from the use of wireless or submarine signalling, and the initial cost would be quite small, and the upkeep trifling compared with that of a lightship.

Wireless and Submarine Signals.—The impossibility of seeing light signals in fog was now overcome by the use of wireless signals, with which submarine signalling was associated. Both were quite unaffected by weather conditions. As sound travels through water at the rate of 4800 feet per second, the submarine bell stroke lagged behind the wireless dot by 1.2 seconds for each nautical mile traversed.

The lecturer dealt with the development of submarine signalling from the early experiments by Collodon and Sturm, in Lake Geneva, in 1826, down to the present time. The present type of submarine bell made of bronze, weighing 220 lbs., and having a period of 1215 vibrations in water,

was, he said, the result of much experimental work, and it was now doing duty in all parts of the world. The striking mechanism was usually operated pneumatically, but in some cases, of which the bell located off the Stack Lighthouse at Holyhead was an example, the bell was operated electrically. A concurrent development had taken place in listening devices on board ship, but in its final form the apparatus was quite simple, consisting of cast iron tanks screwed to the inner skin of the ship, and open against the ship plates. The tanks were filled with water, in which were immersed two microphones. The usual position of the tanks was well forward on either bow. The bell signals could be received at long distances in any weather, and it was clear that the combination of underwater sound and wireless dot signals was more free than any other method of signalling from liability to failure. Following the experiments carried out with apparatus installed in the Nantucket Lightship in 1911, the United States Government had installed synchronous signalling on the Fire Island Lightship, off New York Harbor, which was the first practical commercial station of the kind. The method employed was the combination of the submarine bell and the wireless dot.

The latest type of Fessenden oscillator had opened up new possibilities in sound signalling in water and this device enabled the range of audibility to be increased up to 30 miles, and also permitted signalling by Morse code by the ordinary telegraphic key, as well as the receipt and emission of signals by one apparatus. To these advantages were added the possibility of locating icebergs by reflected sound from the submarine part of the berg, and the determination of depth of water beneath moving vessels by echo from the sea bed. The transmission of speech over short, but useful, distances was a highly probable development. On vessels and in situations where alternating current of sufficient power was available, the use of this new device possessed great advantages.

The Radiophone in Sea Service.—The latest development was the employment of wireless telephony, and by this means the name of the signal station could be communicated to the navigator in plain speech. The installation of the radiophone on the de Forrest system at Point Judith, on the western approach to Narraganset Bay, was the first of its kind. This station communicated its name over a considerable distance, and on vessels approaching within the danger zone gave a second warning. It was intended to install apparatus of this type at several points on the Atlantic and Pacific coasts. This method of signalling, in conjunction with the wireless compass, would enable the bearing of the signals as well as the name of the station, to be ascertained, but the actual distance could only be obtained by synchronous signalling. This recent advance, by which the mariner was spoken to and guided on his way in darkness and in storm, was an extraordinary achievement, and captured the imagination beyond any other example of applied science of our day.

Prevention of Collisions.—In his second lecture, Professor Joly dealt with the employment of synchronous signalling for the prevention of collisions at sea. He pointed out that the existing rules on this subject had been in service for more than a generation, and had been of inestimable advantage. In thick weather, however, reliance had still to be placed on the somewhat crude methods of whistling and listening, and the time had come for a complete reconsideration of the whole question, in the light of modern developments. The existing rules could remain, and, indeed, in close traffic conditions, they would probably prove essential, and under no conditions were modern and old methods mutually exclusive.

The chief advantage of recent developments would be realized in ocean service, where high speeds must be maintained and risks taken.

The reception of the new signals proposed to be adopted would be entrusted to the wireless operator, and future board of trade regulations would, no doubt, require a continuous watch in the wireless room on all ships during thick weather. It was possible, by the exchange of synchronous signals between ships at sea, to obtain the distance between

the vessels to within half, and, probably, within a quarter, of a nautical mile. The combination required was submarine sound and wireless signalling, and for this purpose the submarine bell would be placed in a recess in the bottom of the ship, so that it could be housed when not in use. The oscillator could, said the lecturer, be employed in place of the bell, and experience was now available of both methods. By the use of this system the bearing of the ships, as well as distances apart, could be ascertained, and from the data thus given the collision risk could be accurately determined. It was only necessary to compare what might be called the danger bearing and the danger rate of approach with the actual bearing and the actual rate of approach to obtain security even in thick fog. He proposed the use of an instrument, which he had named the collision predictor. This instrument consisted of a circle, upon which various bearings are shown, and angles measured clockwise from north are engraved. It carries two limbs, which rotate independently about the center, and are divided to show speeds in knots per unit time. They can be clamped in any position. A pivoted arm, carrying a transparent divided scale, is an auxiliary device. When the operator had been given the course and speeds of an approaching vessel, he set one of the limbs to the course of his own ship, and the other to the course of the ship with which signals were being exchanged, and by the aid of the third arm was able to read the relative velocities of the two vessels, and to determine if, and when, collision was threatened.

Further safeguards might arise from the development of wireless telephony, which would simplify the sending and receipt of signals at sea. It was possible to-day for a vessel to sail the ocean calling her own name at regular intervals, and giving at longer intervals her course and speed. If, at the same time, such a vessel were sending out submarine signals, so that other vessels could ascertain her distance, the ship would be surrounded by an aureole, in which were transmitted, in both matter and ether, signals which proclaimed to other vessels which entered that area where she was, her distance away, and her course and speed.—*The Engineer*, 19/4.

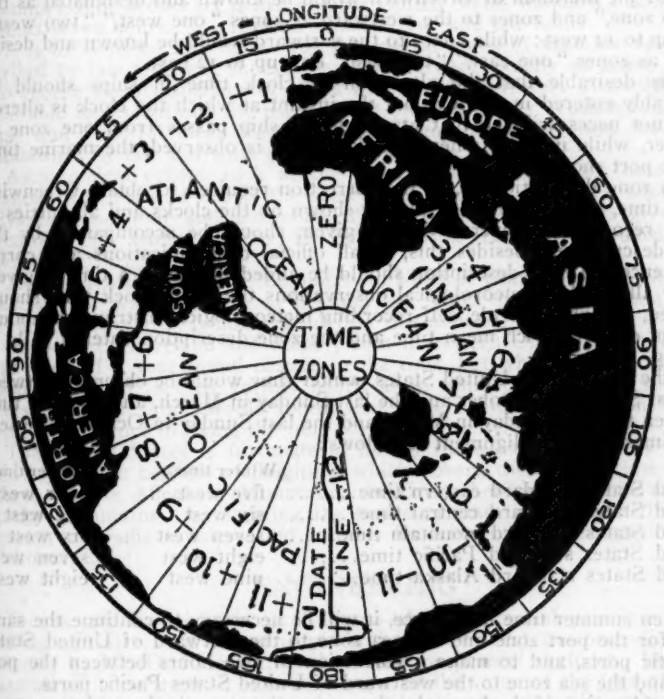
NAVAL OBSERVATORY TIME SIGNALS.—The last annual report of the U. S. Naval Observatory states that the accuracy of the radio time signals sent out from the observatory via the wireless station at Radio (Arlington), Va., has made possible the rating of chronometers anywhere in the North Atlantic Ocean so satisfactorily that the navy has reduced to one the allowance of chronometers for vessels operating along the Atlantic coast. This is a matter of special importance at the present time, when good chronometers are much harder to obtain than in times of peace. The mean daily error of signals sent from the observatory last year was 0.036 second, with a maximum error of 0.21 second. Error is caused by a change in rate of the standard clock during cloudy periods, when observations of stars for time is impossible. The outbreak of the war led to the dismantling of privately owned wireless receiving sets all over the country. The number of requests for exemption which have come to the Navy Department from watch manufacturers, jewelers, scientific laboratories and observatories shows how widespread has been the custom of receiving the official time signals by wireless.—*Scientific American*, 8/6.

STANDARD TIME AT SEA: A SUGGESTION.—Heretofore a ship at sea has been a law unto itself and there has never been any certainty in establishing the time relations between events noted on different ships and their translation into Greenwich mean time. Great Britain, France and Italy have adopted standard time differing by exact hours from Greenwich mean time for use on the high seas. At a British Admiralty conference held last winter it was determined to designate as zero that portion of the earth's surface bounded by meridians 7½ degrees east and west of Greenwich, to designate succeeding 15-degree intervals westward, plus one, etc., and

succeeding 15-degree intervals eastward, minus one, etc. The last intervals each way are plus and minus 12, being parts of a 15-degree interval split by the international date line. Hour-ahead summer time was not approved by the British conference.

Last year the French Minister of Marine established similar standard time for French ships, but carried the numbering eastward around the earth from zero to 23, with hour-ahead summer time.

The divergence between the British and French systems raises an interesting question as to whether the positive numbers should lead to the eastward or to the westward. Numbering positive to the westward, according to the British system, the numerical designations algebraically added to the



local time give the Greenwich mean time. Numbering eastward, according to the French system, the numerical designation added to Greenwich mean time gives the local time, except that a day must be deducted for zones west of Greenwich and east of the international date line. On astronomical maps both right ascension and time are numbered eastward.

The British system is noted on the accompanying map reproduced from a projection devised by Samuel W. Balch, Mechanical Engineer, New York. The map is so projected that time increases around the earth in a clockwise direction.

Descriptive of the portion of the earth's surface over which each time prevails, the French have the word *fuseau* and mathematicians have the geometric expression *lune*, but *zone*, while not accurate, has the sanction of long usage, and the conference was undecided as to designation. The French word *douve* (stave) has also been suggested.

It would seem as if the time had come for the Secretary of the Navy in this country to issue the necessary orders so that time on board ships of the United States working under the Navy Department may conform to the time in use on board ships belonging to the nations with which we are now co-operating. The system would have to conform in the main to that used by the British Admiralty, while observing the provisions of the United States Daylight Saving Law. Therefore, it has been suggested that time zones be established at sea by 24 equidistant meridian subdivisions governed by the mean solar times of the meridians at 15-degree intervals west and east of Greenwich, except that the division containing the international date line shall be divided thereby into two time zones. The zone of the meridian of Greenwich would be known and designated as the "zero zone," and zones to the westward as zones "one west," "two west," etc., up to 12 west; while zones to the eastward would be known and designated as zones "one east," "two east," etc., up to 12 east.

It is desirable that the alteration of clock time in ships should be invariably entered in the log; but the instant at which the clock is altered need not necessarily be that at which the ship passes from one zone to another, while in ports where standard time is observed, the marine time of the port should be kept.

The zone descriptions, *i. e.*, the correction required to obtain Greenwich mean time, should always be plainly shown on the clocks and all entries in ship's records, whenever a date is given, should be accompanied by the zone description. Besides this, in all official communications and correspondence the zone description should be added whenever a time is given.

For all regular meteorological observations the ship's clock time should be used, though, as a rule, self-recording meteorological instruments should be kept on Greenwich mean time and the zone description entered daily in the log.

In the ports of the United States, winter time would be observed between the last Sunday in October and the last Sunday in March, and summer time between the last Sunday in March and the last Sunday in October, the several times being in alignment as follows:

	Winter time.	Summer time.
United States standard eastern time.....	five west	four west
United States standard central time.....	six west	five west
United States standard mountain time.....	seven west	six west
United States standard Pacific time.....	eight west	seven west
United States standard Alaska time.....	nine west	eight west

When summer time is in force, it will be necessary to continue the same time for the port zone and the sea zone to the eastward of United States Atlantic ports, and to make a correction of two hours between the port zone and the sea zone to the westward of United States Pacific ports.

Consideration of the hour-ahead summer time now in force draws attention to a serious drawback of the so-called "Daylight Saving Law." By simply directing every one in the United States to put his clock one hour ahead, the railroads were relieved of the necessity of altering schedules or scrapping time tables in which mention is made of different kinds of time. But this camouflage appears to have escaped the sharp eyes of some astronomers and various errors have crept into announcements. In Great Britain, where daylight-saving is also in force, there has been established a "summer time" for use on land, and Greenwich mean time continues undisturbed for navigation and astronomical purposes. Hour-ahead time is in force this year in the United States from March 31, 1918, to October 27, 1918. In Canada it is in force from April 14, 1918, to October 31, 1918. In Newfoundland it is in force from May 5, 1918, to October 6, 1918. In Great Britain it is in force from March 24, 1918, to September 29, 1918.

It would seem highly desirable for the different countries to agree on the same days for changing time. In the United States the days are pre-

scribed by statute, and alteration could be made only by moving cumbrous legislative machinery. In Canada the days are designated by the Governor-in-Council, and alteration would not be difficult.

Astronomical events, according to their character, require to be timed in one or the other of two ways. To avoid confusion, those which occur at a given instant, without regard to the point of view on the earth's surface, such as eclipses of the moon, moon's phases, and moons of Jupiter, should be given in Greenwich mean time as heretofore and accompanied by directions for reduction during the summer months as follows:

Between the last Sunday in March and the last Sunday in October, for United States standard eastern time deduct four hours; for United States standard central time deduct five hours; for United States standard mountain time deduct six hours, and for United States standard Pacific time deduct seven hours. For British summer time add one hour.

It is to be noted that names for the several kinds of time are now prescribed by law and they should therefore be used exactly as above given. To reduce the multiplicity of times and avoid confusion, it would seem desirable to discontinue the use of such other times as Washington mean time and "central mean time" with different meanings from the times established by law and with which they might be confused.

Astronomical events, such as the rising and setting of the moon and planets, which are at nearly the same local hours at all places, should be advanced one hour and accompanied by a heading that times given are according to United States Daylight Saving Law at standard time meridians.

The Interstate Commerce Commission, which is charged by the Daylight Saving Law with the duty of defining the limits of standard time zones in the United States, is now considering this matter.

In Detroit, Cleveland and other places in eastern Ohio, the experiment was tried of a year-round change in the time, but when winter came the people reverted to their former habits as to times of beginning work by the sun. From this it would appear that there is little need of considering local convenience in fixing the time for a community.

The United States is fortunate in having three natural barriers nearly midway of the degrees of longitude which govern the several time zones. These are the Allegheny Mountains, the Great American Desert, and the Rocky Mountains. By locating the boundary lines along these the least amount of traffic is intersected and the least inconvenience occasioned.—*Nauticus*, 8/6.

ENGINEERING

INCREASING EVAPORATION IN BOILERS.—A new thermal principle in the boiling of water, or a new principle in the flow of heat, has been described recently by Mr. Carl Hering, an American mechanical engineer. In a discussion of it in *Power*, it is pointed out that the value of the legs of a pot is a perennial subject of discussion, while the use of knobs, projections and fins for increasing the absorption and radiation of heat is common practice. Mr. Hering shows the principle upon which such devices should be designed, and by which their effectiveness may be increased materially. When a flame plays against a relatively much cooler body, as in the case of an alcohol lamp and a beaker of water, there is formed a film of extinguished gas between the flame and the body, and this gas cannot escape before it is so cool that it will not even char paper. This is illustrated by the common experiment of sticking a stamp on the bottom of a kettle or other vessel, and boiling water without burning the stamp. Mr. Hering's investigations show that the resistance of this film to the passage of heat diminishes rapidly with the difference in temperature between its confining surfaces; that is, between the surface of the beaker on one side and the flame on the other side. The temperature of the flame is fixed, but that of the receiving surface can be increased by interposing a certain amount of

thermal resistance between it and the relatively cool gas. This is the function performed by the "pot legs" or projections, and if properly proportioned according to the values determined by the experiments, they seem to increase remarkably the activity of the heat transfer. In Mr. Hering's opinion, his investigations disprove the older idea that the effect of such projections is due to increased surface.—*The Engineer*, 24/5.

BRIEF DESCRIPTION OF A POSITIVE WATER CIRCULATING SYSTEM FOR SCOTCH MARINE BOILERS.—By Orland D. Orvis.—The manufacturers of internally-fired boilers with corrugated furnaces very justly claim a certain advantage over all other types set in brick work.

This claim of efficiency might be considerably enhanced if these boilers had any provision made for setting up a proper circulation of water.

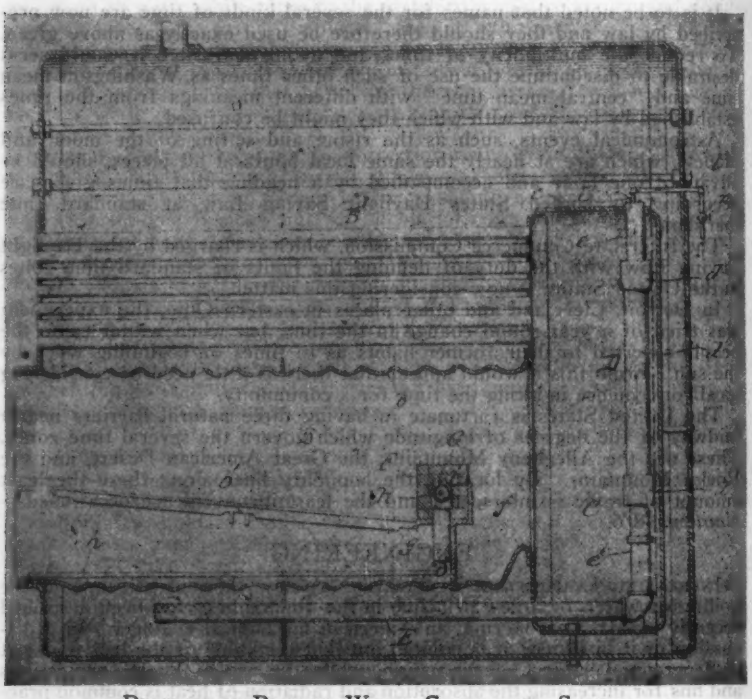


DIAGRAM OF POSITIVE WATER CIRCULATING SYSTEM.

It is hardly necessary to elaborate upon the well-known importance of a rapid circulation of water in steam boilers. Increased circulation means increased evaporation with added horsepower and a substantial saving in coal.

An invention for insuring this much-needed water circulation with all the other essential benefits bound to go with it has, at last, been completed and perfected by a practical scientist of many years' experience in this kind of work, both in this country and in Europe.

Like all important inventions it is very simple and easily understood—it is great in its very simplicity.

Water has the peculiar qualities of being such a nonconductor that it cannot impart heat to its neighboring particles of water, and that is the

reason why it is possible for a Scotch marine boiler, with its poor circulation, to carry a full head of steam, while the bottom of the boiler is practically cold. To equalize the temperature of water in a steam boiler, the water must *circulate* in the true sense of the term, and to generate steam every particle of the water must pass rapidly over a hot metal surface.

To accomplish these long-sought results the inventor has provided in the combustion chamber the most powerful steam generator and water circulator ever constructed, consisting of a suitable number of 4-inch *upright* charcoal iron tubes expanded in steel or malleable iron headers with a pipe connection leading from the bottom header to the water space in the bottom of the boiler, with a perforated inlet pipe so arranged as to insure an equal suction of water through the entire length of the boiler, which, after passing through the generator is discharged, together with newly generated steam, through an outlet pipe leading from the top header into the water space just below the steam space, thereby setting up a rapid circulation of water in the boiler caused by the direct radiation of the heat of the furnace impinging against and enveloping the entire surfaces of the generator tubes, pipes and headers. A globule of steam generated in the heater remains expanded and rises by its levity, carrying water with it, while colder portions come to be heated in turn, thus setting up currents in the fluid.

When desired, bituminous coal may be burned in these boilers, practically without smoke, by using a specially designed apparatus for admitting a mixture of air and steam in proper proportions, in thin sheets, in rapid form, by the vacuum principle, in such a manner as to become thoroughly mixed with the highly volatile products of combustion, thereby creating as near as possible perfect combustion.

It is obvious that this marvelous water circulating system will, by producing a more even temperature of water, relieve the metal of unequal strain, thereby prolonging the life of the boiler, and reducing repair bills.

The advantage gained by circulating water in marine boilers is most convincingly proven by the fact that ships can actually make better speed when being rolled and pitched by a rough sea, which causes a little better circulation in the boilers, while in a smooth sea about one-fourth of the boilers, all below the grate-bars and fire mine, is practically dead for want of circulation.

The apparatus is constructed of the best material, upon correct scientific and mechanical lines, with ample provision made for expansion and contraction without undue strain, and as to durability should last as long as the boiler itself without repairs.

Now let us see just what this simple little scientific invention will do:

1. Will reduce repair bills.
2. Will greatly eliminate smoke.
3. Will save a substantial percentage of coal.
4. Will increase the horsepower and speed of war and other ships.
5. Will reduce the work and care of the engineer and fireman.
6. Will increase the water circulation throughout the entire boiler.
7. Will enable the fireman to get up steam in about half the time formerly required.

The above are some of the conservative claims which may be cited as reasons why the United States Government, and other shipowners, as well as those using Scotch boilers on land, should adopt this economic system.

For example, the actual saving in coal on land boilers will amount to about $1000 a year.

It has been estimated that the saving on ships will be much greater than the above conservative figures, amounting to an average saving in coal on each ship burning 35 tons and upwards a day, of at least $25 a day, $750 a month and from $9000 to $12,500 a year.

This invention has been carefully and thoroughly examined and approved, in fact, highly endorsed by some of the ablest marine surveyors and engineers in New York. [Patent applied for.]

Further information may be obtained at the office of V. Johnsen Co., Inc., 25 Beaver Street, New York City.—*Shipping*, June.

THE AIR SUPPLY TO BOILER ROOMS.—*Abstract of a Paper Read Before the Institution of Naval Architects, March 22.*—By Richard W. Allen, C. B. E.—The subject of air supply to boiler rooms where closed stokeholds are employed is one requiring the greatest attention, especially where oil fuel is used, as this necessitates high air pressures being maintained in the boiler rooms.

The power absorbed in driving the fans is considerable, and any improvement which can be effected by increasing the efficiency of the system, with a consequent saving in steam consumption, reduction in weight and space occupied, will have some influence on the speed of a ship. In this paper the subject is dealt with under the following headings: (1) Air pressure required to produce air speed; (2) velocity of air in the air shafts; (3) enlargements and restrictions in the air passages; (4) deck intake, cowl, and weather flaps; (5) velocity of air at the eye of the fan; (6) necessity of fitting suitable inlet rings; (7) steam-line shutters for fan inlets and their influence; (8) loss of air pressure in the boiler room due to vacuum at fan inlet; (9) increase in steam consumption of fan installation due to vacuum at fan inlet; (10) increase of output due to properly designed casings, (11) arrangement of deflectors on fan casings; (12) direction of rotation of the fans; influence on distribution of air in the boiler room; (13) oil fuel—quantity of air required for combustion; and (14) progress in fan design.

The speeds to be recommended for velocity of air in the air shafts are from 20 feet to 25 feet per second. The pressure required to produce this velocity is relatively small, viz., .13 inch to .20 inch in W. G., but increases in the ratio of the square of the velocity, so that to produce double the air speed four times the pressure is necessary, and to produce four times the speed requires 16 times the pressure.

It frequently happens that most of the velocity energy of the air is lost, which means that the fan must be designed for the extra pressure corresponding to the air speed if the required output is to be obtained. For this reason a low air speed is desirable, as it reduces the work to be performed by the fan for a given air pressure to be produced in the boiler room.

That air trunks are sometimes constructed necessitating very high speeds is proved by several recent cases brought to the author's notice on four different classes of ships, as follows: Ship (a), 48 feet per second; (b), 62 feet per second; (c), 78 feet per second, and (d), 65 feet per second. In every case the velocity is excessive, especially for air shafts as at present designed.

In many classes of ships difficulties have been experienced in obtaining the specified air pressure in the boiler room, necessitating modification by increasing the areas of the suction trunks, with satisfactory results. It must be remembered that to obtain a speed of air a pressure difference has first to be set up; this pressure energy then is converted into velocity energy, the greater part of which subsequently gets lost, as very little of the speed is converted back to pressure. Therefore, the higher the air speed the greater will be the loss. As stated, it is a difference of air pressure that causes a flow of air, and expressed in this way the statement applies equally to suction or discharge, *i. e.*, to pressures above or below the atmosphere.

There are many points in the air-passage where restrictions in area are frequent. It would be well to enumerate the chief causes:

(a) Restriction due to the casings which stand just underneath the air-shafts, thereby reducing the area available for the junction between the air-shaft and fan-room. Speeds up to 40 feet and more are often occasioned by this arrangement.

(b) The fan compartments are often too narrow, thereby restricting the area of access to the inlets of the fans placed amidships. This could be improved by the side of the fan-casing not reaching up to the deck of the fan-room, as this would make available the area between the fan-casing and the deck, and reduce the velocity of the air.

(c) The deck coaming on the intake shaft is sometimes carried a considerable distance into the fan compartment below the deck-level. This coaming may be arranged so that it does not seriously restrict the area of the fan compartment, by making it narrow, or if deep, by cutting away or opening out.

(d) Bearer girders and stiffening plates are a frequent source of restriction of area. These may have holes through the webs without seriously impairing their strength.

(e) The covers for the fan-impeller inlets should fold back flat on the casings. They are frequently prevented from doing so by some obstacles on the plating behind them, or because the vertical stiffeners are situated close to the eye of the fan.

(f) The arrangement of the steam pipes also makes a great difference. As an example, a number of pipes, one behind the other, causes no greater reduction of cross area than one pipe, whereas side by side the reduction would be directly proportional to the number of pipes.

(g) Sharp bends in the air-shaft cause losses in speed and pressure, and bends should therefore always be made of large radius, or have easy curves without any sharp corners. A particular instance where this is necessary is when the air passage is led under and in between the smoke uptakes.

(h) The restriction of area caused by stowing spare gear, lockers, electric distribution boxes, and other impediments in the intake shafts should be carefully weighed against the convenience offered.

(j) Girders and angles, though not generally abnormal, sometimes cause a considerable restriction in the intake-shaft, and where their presence is unavoidable they ought to be carefully encased in sheet steel shrouds of a stream-line design.

(k) The area of entry through cowl or hood to the intake-shaft is frequently restricted, due to position, shape, and height of neighboring obstacles.

(l) Restriction due to the interposition of gratings.

Because air is invisible it is not generally sufficiently grasped that it is a body. The air-passages should therefore be regarded as pipes or conduits for steam or water, and not as convenient open spaces performing no function.

Deck Intake, Cowl, and Weather Flaps.—The design of the deck intakes, with their cowls and weather flaps, has been so greatly influenced by the requirements of protection from waves and spray in bad weather, that less attention has been given to the proper admission of air without loss or restriction. Frequently the area of admission is found to be insufficient, or part of that provided is ineffective. Also, the shape of the passage of air into the shaft makes the entry difficult. When the weather flaps come into operation to shield against wind and sea, the entrance of air practically ceases correspondingly. The difficulty of getting the air into the shaft becomes greater as the speed of the ship increases, and trouble may be encountered, particularly on fast vessels.

Many different types of deck intakes, including cowls and weather flaps, have been tried, the design depending upon the situation of the intake and its surroundings on the ship, as well as the class of vessel and the work for which it is intended.

A series of experiments has been made to establish the relative efficiency of different types of air intakes, including the designs generally in use, and also to discover the most efficient shape of entrance to conform to the natural line of flow.

The essential requirement was to provide a guide which would perform the protective duty, but at the same time induce the flow of air into the shaft, especially when partially closed against the weather.

The design proposed to replace the existing shapes offers a marked improvement in efficiency, namely, 83 per cent, against 35 per cent. The guides or shields are of stream-like section, and pivoted to the top of the air intake shaft, so that they can be opened any desired amount. Two recent innovations, the center guide and nozzle, are embodied in the deck entry. The center guide is in the form of a deflector or inverted pyramid attached beneath the cowl top, and the nozzle provides a *vena contracta* flow at the entrance to the intake shaft.

In explanation of the manner in which the center guide and nozzle contribute to prevent loss of pressure, it has been proved that where these contrivances are not provided the whole of the space which they occupy is filled with eddy currents which are continuously absorbing energy.

The reason for the formation of the eddies is partly that the direction of the air is changed on entering the shaft and owing to its velocity sweeps round the corners, and partly owing to the law of *vena contracta* for the flow of all fluids, either liquid or gaseous, at the entrance or exit of duct.

The center guide and nozzle conform to the correct line of flow to prevent the formation of any eddies.

Another improvement to which importance is attached is fitting of the diaphragms, placed athwartships, subdividing the air intake shaft. When a ship is travelling at a high speed there is a tendency for the air to rush past the intake without being drawn in, and for the air which does not enter to bank up in the after side of the intake shaft, with a consequent tendency to starve the forward fans.

By fitting diaphrams the tendency to unequal air supply fore and aft will be efficiently counteracted, and all the fans will receive their due share of air.

The velocity of air through the fan eye depends very largely on the design of the fan and type of the driving motor. With an engine-driven fan the inlet eye can in most cases be made large enough to keep the inlet speed low without reducing the radial length of the blades too much. With a steam-driven turbine fan, in order to obtain an efficient turbine, the revolutions per minute must be kept fairly high, thereby reducing the fan diameter necessary for a given pressure. In order to keep an effectual radial length of blade the inlet eye must be reduced as compared with an engine-driven fan, and the entrance air speed accordingly increased.

Since the introduction of the new design of fan, in the year 1910, the tendency has been to reduce the diameter of the fan still further, so as to economize in space required for the fan installation. In order to obtain at the same time higher fan efficiencies, thereby reducing the driving power required, the velocity of the air at the eye must always be very carefully considered. It is generally desirable not to exceed a speed of 40 feet per second.

It has repeatedly happened that a fan has failed to deliver its designed output, and on examination this has been found to be due to an inlet ring badly fitted to the fan eye, or to an inlet ring of unsuitable shape. It is therefore important to give proper consideration to this item.

Streamline Shutters for Fan Inlets.—Owing to the elastic nature of air a current is generally accompanied by a series of undulations and pulsations.

The relative internal directions of motion at different parts of the stream may be examined at any required moment by the aid of instantaneous photography.

In the case of air approaching the suction inlet of the fan, this action has a marked influence. In centrifugal fans of high efficiency the vanes are so designed as to coincide with the direction of the vectors of the compounded velocities of the air.

Therefore since the vanes are fixed, in order that they may operate most efficiently it has been found desirable to guide the air at the entrance to the

fan-eye in parallel streams, normal to the fan inlet, and also to correct or dim the pulsations. Evidence of the beneficial influence of the stream-line shutter has been provided by tests.

When folding doors are fitted it is necessary to fit a wire guard to protect the impellers from articles which might be drawn in, and these guards further affect the air inlet to the fan. A great improvement in these conditions has been introduced with the fan-eye shutter, which replaces the loose and hinged folding doors and the wire guard. It can be opened or closed instantaneously by moving a handle. The shutter consists of a number of slats operated by a connecting bar or bars. A lever is attached to the pivot of each slat, and the ends of the levers are attached to a connecting bar at the end of which is an operating lever and handle. The slats are preferably "stream-line" in cross-section, and each slat consists of a bar of "stream-line" cross-section, to which is riveted a thin metal plate. When the shutter is closed the end of one slat engages with the adjacent slat, and makes an air-tight connection with it.

If, in the passage from the top deck down to the fan inlet, a loss of air-pressure occurs, say of 1-inch water-gauge, due to sudden enlargements, high speeds, and sharp corners, then in order to draw the air into the fan rooms a vacuum of one inch must be produced by the fans themselves. Therefore, if a fan designed for 4-inch water-gauge of pressure in the boiler-room has first to produce 1-inch water-gauge of vacuum in the fan compartment in order to draw the desired quantity of air through the air-passages, then obviously it can only maintain three inches in the discharge side, *i. e.*, in the boiler-room, instead of 4-inch water-gauge.

Exhaustive tests have been carried out which prove that the air-pressure in the boiler-room equals the total pressure exerted by the fan less the amount of suction at the fan-inlet.

The results show that, for a given speed of revolution and quantity of air, the total pressure across the fan is constant, and if a resistance is placed in the fan inlet, causing a rise in vacuum, there will be a corresponding fall in discharge pressure.

In view of the fact that the design of a ship sometimes necessitates high velocities and certain obstacles in the air-passages, the possible losses produced should be allowed for when considering the design of the fan.

Taking in consideration the characteristic curves of the performance of centrifugal fans, it would be desirable to specify fans designed for increased air-pressures, beyond that which is necessary for smokeless combustion, instead of increased quantities, as is frequently done, when there is any danger of air-shortage. By this means there would be a reserve of pressure to overcome resistances in intake passages if they occur. At the same time a greater supply of air to meet emergency conditions would still be available.

Steam Consumption and Vacuum at Fan Inlet.—From the many steam consumption tests which have been made from time to time on various sizes of fans and engines, it may be taken that the increase in the steam consumption of fan installations is about 20 per cent due to 1-inch vacuum on the inlet.

This loss is considerable, especially with large numbers of fans, and shows the necessity of reducing the vacuum on the inlet side of the lowest possible limit.

A number of tests have been made which prove that the performance of a fan is considerably improved in output as well as efficiency if attention is given to the design of the fan casing; and to the discharge of the air from the fan case. Where fan casings are provided it is of the utmost importance that they should be constructed as a volute form, designed specially to suit the exact conditions for each ship, which are governed by the quantity of air to be delivered and the air pressure required.

When several fans are placed side by side, as is often the case in the fan compartment of a boiler-room, it is found that some of the air delivered

from one fan obstructs the delivery of air from an adjacent fan, thus diminishing the output. This objection is overcome by the employment of guides or deflectors of special form.

Deflectors have been proved to be of greatest value when the output of air is large or the velocity of the air is high. This necessarily follows, since both conditions are interdependent and have a tendency towards high resistance of flow, which calls for high pressure drop; thus, for any particular ship the benefit derived would be most when the demand on the fans is at a maximum. In comparing different ships, the larger the quantity of air supplied, or the higher the velocities of air currents, the greater will be the saving effected by the deflectors.

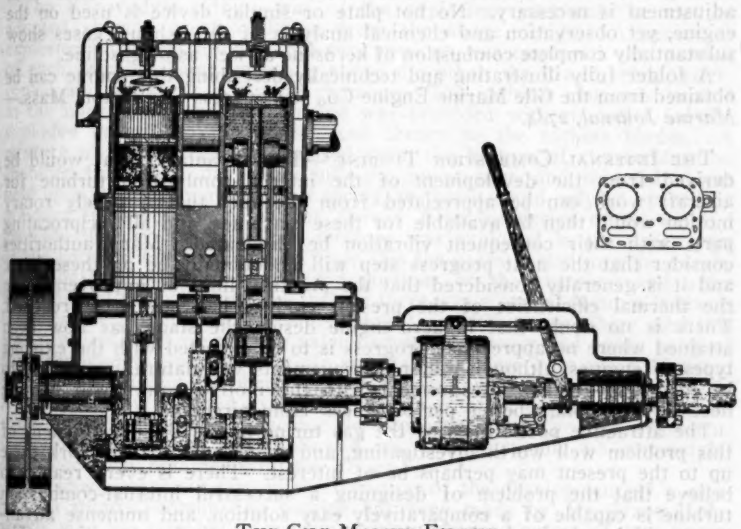
From experiments carried out on speed trials several valuable observations were recorded. It was found that some of the air leaving the fan at high velocity went straight to the furnace doors. These streams may be of great value if guided correctly by deflectors; the losses are then the minimum possible under any conditions, as there are no losses at all incidental to the conversion of velocity to pressure energy and back again. The rest of the air leaving the fans supplies the storage of air in the boiler-room, that is to say, its velocity is changed into pressure energy, which is converted as demanded by the pressure difference across the boiler into the required velocity of air passing through the furnace doors. The storage pressure in the boiler-room produces low velocity streams radially to the furnace doors from all directions. Considering the value of the high velocity streams described, much benefit may be derived from avoiding, where possible, any obstacle being placed near the periphery of the impeller. Deflectors should always be arranged so as to guide the streams of air in a correct and natural path. Deflectors should be fitted as close as possible to the periphery of the fan impeller, only allowing a running clearance of about one inch. The guard round the fan, which has a greater clearance, should be fitted afterwards. Since the velocity of the air streams are highest as they leave the fan, the momentum of the air streams is then at a maximum, and deflectors, which act as a guide to the streams, can be applied with the greatest effect. Recent observations have demonstrated the value of long deflector plates as compared with short ones, and where there is room for them it is desirable to have long plates, so as to deflect the streams of air gradually, and also to act as a guide for a greater distance.

Direction of Rotation of the Fans; Influence on Distribution of Air in the Boiler-Room.—In the disposition of a group of fans in the boiler-room little or no consideration has in the past been given to the influence which direction of rotation of the fan has on the uniform distribution of air in the boiler-room. It is generally assumed that the pressure which the fans create in the boiler-room is sufficient and uniform enough throughout the boiler-room to supply all the furnaces equally with air. The air currents, however, caused by the discharge of air from the fan-casing, and also from the periphery of the fan itself where it is open to the boiler-room, are so considerable with the latest types of fans, which have to work against a considerably higher air-pressure than formerly, that consideration has to be given to the possibility of such air currents blocking the passage of air to the extreme parts of the boiler-room. The lifts and airlocks reaching down into the boiler-room from the fan compartment add considerably to the difficulty of getting the air uniformly distributed. It will be realized that the furnaces of the boilers placed amidships are plentifully supplied with air, while the furnaces situate at the wings do not get such a direct and ample air supply. Considerable improvements in this direction can often be achieved by re-grouping the fans, and reversing the direction of rotation of the fans, thereby obtaining a uniform supply over the whole width of the boiler-room.

Progress in Fan-Design.—Until a few years ago there were certain rules which were generally accepted and applied for the size of all machinery placed on board ship. In the latest ships, considerations of weight and space, and also of efficiency in working, have become of such vital im-

portance that increasing investigation has been devoted to obtain the maximum output possible with a fan installation of minimum weight and space, absorbing as little power as possible for a specified duty. There are always limiting factors to the increase of efficiency, and to the reduction in size; the greater the improvement achieved the more difficult it is to make further appreciable strides towards reaching the limits. Generally speaking, with the ever-increasing air-pressures, and consequent greater air-velocities through the fan vanes, together with the large volumes to be dealt with, in order to achieve a maximum all-round efficiency, great attention has to be given to the design of the vanes of modern fans, so as to make the air streams passing through them follow as closely as practical limitations will allow the laws of dynamics, with due consideration of the physical properties of the medium one has to deal with. In conclusion, the author would remark that he has only treated the subject very briefly, as the results of the research work cannot, under present circumstances, be presented as fully as would otherwise be the case.—*Nautical Gazette*, 1/6.

A NEW COMBUSTION ENGINE.—The Gile engine illustrated herewith is an internal combustion engine based on an entirely new principle, which can



THE GILE MARINE ENGINE.

be applied to all power purposes. The preparation of fuel for combustion is effected within the cylinder itself, which is a radical departure from other types. This engine also has a perfect suction and scavenging stroke. The fundamental and new principles involved are the mechanical mixing of the fuel in the cylinder, so that it is instantaneously prepared for complete combustion, a result which has been heretofore impossible to obtain in any other type of engine. By forcing the charge by compression around the sub-piston head through a series of small flutes or restricted passages to the combustion chamber against the cylinder head like so many jets of steam, the Gile engine produces a perfectly homogeneous mixture of the highest explosive pressure ever known, in proportion to the compression. The result is that a much larger proportion of air is used than has been heretofore known in engine practice.

Much higher initial pressure is claimed by its inventors, and the usual exhaust and water jacket losses, which in other types of engines are largely due to slow, incomplete combustion, are practically eliminated, while carbonizing of the fuel, even of kerosene, so troublesome in other types, is unknown. No fire gets by the exhaust valve. The temperature at the outer side of the exhaust valve is not more than 500 degrees F. when the manifold is removed and a thermometer is inserted to the bottom of the valve housing close to the valve itself. The perfect combustion consumes all fuel elements and nothing is left clinging and burning on the cylinder wall after the power stroke is completed and the new cool charge coming in immediately absorbs a large portion of the heat left from the preceding explosion. As a consequence, the Gile engine develops twice as much horsepower as a four-cycle type of the same bore, stroke and revolution per minute, with a fuel consumption of about one-half a pound per horsepower hour.

A further remarkable feature is that it burns kerosene as readily as gasoline, with standard equipment and without preheating. The fuel is drawn cold from the carburetor, driven through flutes in the cylinder walls, compressed, and fired by a spark, as with gasoline; in fact, in changing from gasoline to kerosene and *vice versa,* no change in the engine or in adjustment is necessary. No hot plate or similar device is used on the engine, yet observation and chemical analyses of the exhaust gases show substantially complete combustion of kerosene as well as of gasoline.

A folder fully illustrating and technically describing this engine can be obtained from the Gile Marine Engine Co., 50 Congress St., Boston, Mass.—*Marine Journal,* 27/4.

THE INTERNAL COMBUSTION TURBINE.[1]—The advantages that would be derived from the development of the internal-combustion turbine for aircraft work can be appreciated from the fact that a purely rotary motion would then be available for these machines, and all reciprocating parts with their consequent vibration be eliminated. Many authorities consider that the next progress step will undoubtedly be on these lines, and it is generally considered that the practical limit of improvement in the thermal efficiencies of the present engines has now been reached. There is no doubt that in aero-engine design the stage has now been attained where no appreciable progress is to be expected with the existing types of engines, although minor improvements will naturally continue to be made, so further advancement with the motive power will become necessary to obtain better performances from aircraft.

The attractive possibilities of the gas turine makes the development of this problem well worth investigating, and an account of the work done up to the present may perhaps be of interest. There is every reason to believe that the problem of designing a successful internal-combustion turbine is capable of a comparatively easy solution, and immense advantages will be obtained when this engine is a practical proposition. The turbine which was designed by M. René Armengaud was built in two sizes, one of which was constructed to have an output of 30 horsepower, and the other was expected to develop ten times this power.

Armengaud Principle.—The 300-horsepower Armengaud turbine developed practically the power for which it was designed, and both sizes of engines worked on the constant-pressure principle, the combustion of the mixture taking place continuously on its entrance into the combustion chamber. The fuel used during the tests was petrol, and electrical ignition was employed on these machines. Owing to the high temperature of the gases during combustion, the chamber was divided into two portions, the first being lined with carborundum, and the second was jacketed with a coil through which water flowed continuously. This has the effect of cooling the gases, and the water was admitted to the turbine in front of the nozzle when it was vaporized by the ignited gases and had a further cooling effect.

[1] Courtesy of *Flying* (London).

In these turbines the actual medium producing power therefore became a mixture of steam and gas, so that power was generated by this steam on a somewhat similar principle to that adopted in semi-Diesel engines using water injection. In this, as in all other gas turbines, the air had to be compressed in an external air-compressor before being admitted to the combustion chamber, which is one of the inherent defects of the principle of the internal-combustion turbine, especially if a reciprocating compressor be employed. With the 300-horsepower Armengaud machine a compressor of the rotary type was adopted, coupled direct to the gas turbine, and the arrangement was fairly satisfactory, the air entering the combustion chamber at a pressure of about 100 pounds.

Fuel.—The Armengaud design of internal-combustion turbine could doubtless have been developed to employ heavy fuel oil, and although the results obtained from the engines apparently gave great promise, no work seems to have been recently carried out in improving or modifying this design. It is uncertain exactly what degree of economy was obtained with the turbine, but it is understood that the consumption was not reduced to nearly that of the present designs of reciprocating engines, which develop a horsepower with a heat expenditure of less than 10,000 British thermal units.

The Karovodine turbine was of the explosion type, and the method adopted showed great variation from the above design. A series of explosion chambers divided into two portions was employed, one portion of each chamber being vertically above the other, the lower being water-cooled and acting as a mixing chamber. The ignition plug was located in the upper part, and this portion was provided with an outlet for the exploded gases into the nozzle, and thence to the turbine blades. A mixture of air and gasoline passed from the bottom of the combustion chamber through a flap valve into the upper part, and this valve was held upon its seat by means of a spring, so that it could only be opened by pressure from beneath or suction above. After admission of the air and gasoline through the valve the mixture was exploded in the upper part of the combustion chamber, and from this the gases passed into the nozzle.

Combustion occurred in the top portions of the chamber, and after admission of the gases into the turbine there was a partial vacuum in these, the pressure being about 2 pounds below that of the atmosphere, and this was sufficient to cause the flap valve between the lower and upper parts of each chamber to open, so that air and gasoline were once more admitted into the combustion chamber. The charge was again ignited, and the cycle was continually repeated to obtain uniform rotation of the turbine. The results obtained from this machine were apparently quite good, but unfortunately they have not been followed up, and practically no commercial experience was obtained with the design.

The most important step in the direction of the development of a commercial internal-combustion turbine has been made by Mr. Hans Holzwarth, who has now built a machine with a designed output of 1000 horsepower, and has made numerous tests upon it. This turbine embodies a totally different principle from those on which the two previous types were designed, although it is also an explosion turbine, and it may be mentioned that previous to constructing this large machine a small experimental one was built in 1908. The tests carried out on this engine were most instructive, and it was from the results of these tests that modifications were made in the larger machine, upon which a considerable number of important trials have been carried out by the inventor, which were most successful.

Holzwarth Turbine.—The Holzwarth turbine has in many ways the most logical principle of operation which has yet been developed in any internal-combustion turbine, and the designer states that the following conditions are essential for a practicable machine: (1) Operation with periodical combustion, *i. e.*, the explosion type must be used as with reciprocating engines. (2) The space in which combustions takes place must be closed on the exhaust side leading to the actual turbine, at least

during the greater portion of the charging with the combustible mixture. (3) The combustion chamber must be closed on the admission or charging side during the combustion and expansion period. (4) The combustion chamber must be scavenged with air during the interval between the individual explosions.

It is equally satisfactory for the closing arrangements to be on the exhaust or delivery side on a turbine complying with the above conditions and provided with a combustion chamber, or for the admission or charging side to be provided with mechanically operated valves which serve to deliver air into the combustion chamber. The Holzwarth turbines were of the vertical design, with the shaft arranged vertically, but the construction is equally applicable to machines of the ordinary design with horizontal shafts.

A series of combustion chambers are provided around the periphery of the machines, the number of these in the 1000-horsepower turbine being 10, and they are arranged so that the explosion takes place in one combustion chamber after another around the whole circle. The oil fuel or gas is admitted to the combustion chamber, which at the time of the admission is full of air at a comparatively low pressure, it having been previously pumped into the combustion chamber and thence through the turbine at the end of the previous explosion in order to scavenge out and cool the machine thoroughly. After the admission of the gas the inlet valves are closed, and explosion is caused by means of an electric spark; a valve leading to the turbine nozzle is then forced open by the pressure, and the gases pass through to act on the vanes of the machine.

The gases acquire velocity in their passage through the nozzles, and then impinge on the vanes, which are of the ordinary impulse type with two rows of moving blades and one row of fixed blades. The nozzle valve is opened by the pressure due to the explosion, but is afterwards closed gradually by mechanical means, and during the period of closing more scavenging air enters the turbine under slight pressure, so as to clear out the products of combustion from the machine, leaving it full of fresh air ready for the admission of petrol or other fuel into the combustion chamber for another explosion.

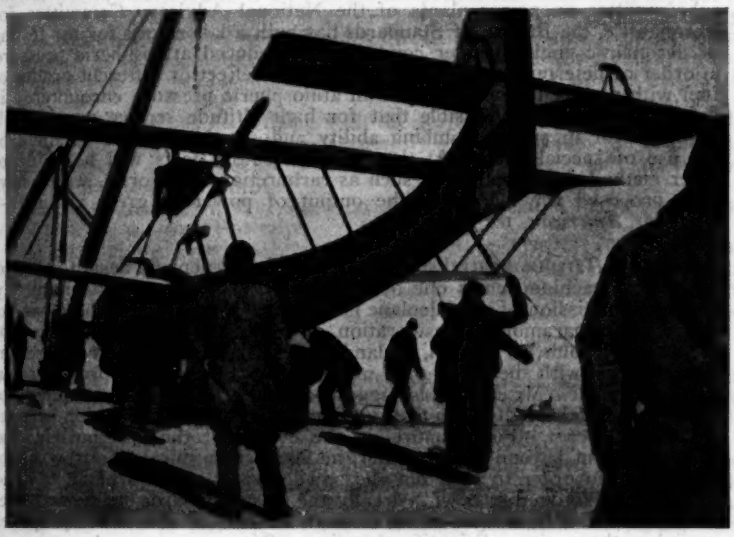
Cooling.—The air admitted to the machine also has the effect of maintaining the temperature at a reasonably low limit, and no water cooling was necessary, as no excessive heating of the blades was found to occur. The blades were constructed of nickel-steel, and as water was not formed during the process of combustion, no corrosion occurred throughout the long period through which the turbine was tested, also the blades gave no trouble. It was difficult to obtain the anticipated power out of the machine, and the consumption was not so satisfactory as had been anticipated; but many fuels were successfully employed, and it is interesting to note that heavy oil was utilized with success, a pulverizer of the Diesel type being adopted.

The experiments demonstrated that a high specific power could not be obtained from the combustion chambers when the number was relatively small, and that the efficiency of these chambers is lower when they are small than when of moderate size. This tends to indicate the difficulty of constructing a relatively low-powered gas turbine and the suitability of this type of engine for the largest outputs. It is, of course, apparent that there are no maximum limits of power with a turbine, as in a reciprocating engine, where the pressures on the piston cannot be allowed to reach a high figure. It was found that the design of the nozzles for gas could not be based on that of the ordinary steam turbine nozzles, and that the air-scavenging process between two explosions was necessary for reasonable efficiency with this cycle.

The scientific aspect of the design of the Holzwarth turbine is of great importance, and data of considerable value has been deduced from the results of the experiments on his machines. The temperature of the mixture before ignition has an important influence upon the efficiency of a gas

turbine and this should be approximately the same as that of the outside air; also many other important points in connection with the design of internal-combustion turbines were decided from the results of these experiments. No attempts were made to obtain an extremely light weight per horsepower, such as is necessary for aircraft work, as up to the present the experimenters have confined their attention to machines for industrial work.

An internal-combustion turbine proposed by Inrig which makes use of the steam both for purposes of scavenging and keeping the temperatures of the internal parts within reasonable limits has been built, and is intended mainly to employ heavy oils. This is of the horizontal design with an output of 30 horsepower and the ordinary reaction blading with several rows of blades is employed. The machine is of the double flow type, and the admission takes place in the center through one port, there being three valves, one each for air, oil, and water injection. The valves



AMERICAN NAVAL FLYING BOAT BEING SET OFF SHORE IN FRANCE. THIS MACHINE, WHICH IS EVIDENTLY OF FRENCH DESIGN, IS INTERESTING ON ACCOUNT OF ITS PECULIAR TRUSS AND ALSO BECAUSE OF THE CONSTRUCTION OF THE STERN.

are of the piston type, and are operated by eccentrics mounted on a lay shaft driven from the main shaft through gearing.

The air compressor has to supply air at a high pressure in order to give a sufficiently high temperature to ensure combustion of the heavy fuel which is injected into the turbine immediately after the air. Directly the combustion commences, water is sprayed in, and, owing to the heat generated by the combustion of the fuel, is converted into steam. The ignited gas and steam then passes through nozzles on to the vanes of the turbine, in which they expand down to atmospheric pressure, and their energy becomes converted into work. There is no doubt that the problem of designing a commercially successful internal-combustion turbine will eventually be solved, and there appears to be no reason to anticipate that this type of engine cannot be applied successfully to aircraft.—*Aviation*, 15/5.

AERONAUTICS

MONOPLANES AND TRIPLANES.—For the last two years of war the biplane type has been in practically universal use, although during the last year the British have employed a few squadrons of Sopwith triplanes with excellent results. However, at present there are many indications that designers are again swinging back to the monoplane in search of greater speed, better climbing ability, and greater maneuvering power. In a recent British official statement it is admitted that excellent results are being obtained at the front with a new monoplane. On the other hand, the Germans are now trying their hand at triplanes, and it is reported that they are rapidly increasing the number of this type flying at the front.—*Scientific American*, 18/5.

AERONAUTICAL ENGINES AT HIGH ALTITUDES.—In co-operation with the subcommittee on power plants of the National Advisory Committee for Aeronautics, the Bureau of Standards has built a laboratory for the testing of aeronautic engines under conditions of reduced atmospheric pressure, in order of determine, among other things, the effect of different grades of fuel with respect to the variations in atmospheric pressure encountered in flying. It is thought possible that for high altitude service considerable improvement in power, climbing ability and speed might be obtained by the use of special fuels. At the same laboratory tests will be made of other methods and appliances, such as carburetion accessories, which have been proposed for increasing the output of power at great altitudes.—*Scientific American*, 18/5.

SHOOTING THROUGH THE PROPELLER HUB.—In battleplane design the placing of the machine gun is one of the leading problems. Quite naturally, too, for the mission of a battleplane is to fight the enemy, and the means of attack are a paramount consideration in consequence. So the invention of A. J. Reynolds, of Dublin, Ireland, is of particular interest at present, since it deals with the firing of a machine gun through the propeller hub of a battleplane. Mr. Reynolds suggests the use of a propeller mounted on a hollow shaft through which the gun fires, and a gear transmission between engine and shaft. Furthermore, in the even that the gun muzzle does not extend out beyond the propeller, he suggests a spiral or screw in the gun tunnel in order to suck out the powder gases. The scheme is good, although not altogether new. Already the Hispano-Suiza engine has been arranged with a Lewis gun firing through the hollow shaft of a propeller, geared to the engine.—*Scientific American*, 18/5.

SPRUCE FOR AIRPLANES.—It was recently announced in Washington that 30,000,000 of the 60,000,000 feet of spruce timber required for the construction of airplanes this year has been cut; and that the total amount required would be delivered to the government airplane building plants before July 1.—*Scientific American*, 8/6.

BROWNING GUN FOR AIRCRAFT.—After an official test by a board of officers of the army the Browning machine gun has been selected for use on aircraft, it being one of the three types of machine guns in which the rate of fire can be so synchronized with the revolutions of the propeller of a tractor type of airplane that the gun can be fired through the revolving blades of the propeller. For the test, one of the Browning guns was mounted on the frame of an American combat plane and connected with the airplane engine. The test was conducted on the ground, and in place of the propeller a metal disc was attached to the crank shaft. The gun was then required to register hits on the metal disc as it revolved at varying speeds from 400 to 2000 revolutions per minute. The slightest "hang fire" or delay in action on the part of the gun would have been shown by the failure of the bullets to hit

precisely on the spot on the disc representing the center of the zone of fire. The gun functioned perfectly. The Browning gun to be used with aircraft is the heavy type with the water jacket removed. Besides the Browning, the U. S. Army will employ the Marlin aircraft gun as a synchronized weapon. Several thousand of these have been manufactured and the gun is in quantity production.—*Army and Navy Journal*, 1/6.

BRITISH FLYER SEEKS AMERICAN FACTORY FOR U-BOAT SIGHTER.—The most effective air device which Britain has developed in its campaign against the submarine was brought to an Atlantic port yesterday by Captain Gilbert More, of the Royal Air Force of the British Army. It is one of two models used in sighting by British aviators when bombing U-boats.

"It is a little device," said Captain More, "but in its tryouts, many of which were in actual engagements, it has been found 100 per cent effective. It is without lenses, and if we can get the proper manufacturing support in the United States, the U-boat boys will have something to remember us by.

"In England, factory space is so crowded that we can hardly introduce any new work, no matter what its importance, and it was for that reason decided that we would put the American factories in a way to help us if they can."

Captain More has been flying with the Royal Air Force since 1914. He recently escaped death almost miraculously after a fall into the water, and has developed a bad case of rheumatism, which will keep him from active fighting for several months.

In discussing the airplane situation abroad he declared that there is vital need of more aircraft at once.

With Captain More was Lieutenant M. L. Bayard, of the Twenty-fourth Army Corps, who is here to aid the French Military Mission. Lieutenant Bayard has three wound stripes and wears the War Cross with two palms and a star, the Russian Cross of St. George and the Legion of Honor.—*N. Y. Herald*, 18/5.

OFFICIAL DESCRIPTION OF THE LIBERTY ENGINE.—The first official description of the Liberty aero-engine was issued on May 15 by the War Department, after many fanciful reports as to its characteristics had generally gained credence.

The official statement makes highly interesting reading on several accounts, as one is able to judge that the Liberty engine does not embody any revolutionary feature in either method of construction or operation. This will tend to increase general confidence, for whatever failings this engine may still display, are a matter of detail which should not prove difficult to straighten out in the necessary process of "tuning up."

It is highly proper that official credit is at last given to the engineers who have been principally responsible for the design of the Liberty engine, for once the War Department has departed from its customary policy of secretiveness in telling the public about our military preparations. While one fully realizes the value of this policy in certain specific cases where information may prove of value to the enemy, no harm may be expected from the publishing of details of the Liberty engine, since it follows well-known engineering standards, while on the other hand it will go a long way to quiet sundry rumor mongers and afford the technical man and thereby the public the conviction that nothing is fundamentally wrong with the Liberty engine.

Here is the statement prepared by the War Department:

The designs of the parts of the Liberty engine were based on the following:

Cylinders.—The designers of the cylinders for the Liberty engine followed the practice used in the German Mercedes, English Rolls Royce, French Lorraine-Dietrich, and Italian Isotta-Fraschini, before the war and during the war. The cylinders are made of steel inner shells surrounded

by pressed steel water jackets, a method of applying which the Packard Motor Car Co., by long experiment, had developed. The valve cages are drop forgings welded into the cylinder head. The principal departure from European practice is in the location of the holding-down flange, which is several inches above the mouth of the cylinder, and the unique method of manufacture evolved by the Ford Co. The output is now approximately 1700 cylinder forgings per day.

Cam Shaft and Valve Mechanism Above Cylinder Heads.—The design is based on the Mercedes, but was improved for automatic lubrication without wasting oil, by the Packard Co.

Cam Shaft Drive.—The cam shaft drive was copied almost entirely from the Hall-Scott motor; in fact, several of the gears used in the first sample engines were supplied by the Hall-Scott Motor Car Co. This type of drive is used in the Mercedes, Hispano-Suiza and other engines.

Angle Between Cylinders.—In the Liberty engine the included angle between the cylinders is 45 degrees; in all other existing 12-cylinder engines it is 60 degrees. This feature is new with the Liberty engine, and was adopted for the purpose of bringing each row of cylinders nearer the vertical and closer together, so as to save width and head resistance. By the narrow angle greater strength is given to the crank case and vibration is reduced.

Electric Generator and Ignition.—A Delco ignition system is used. It was especially designed for the Liberty engine to save weight and to meet the special conditions due to firing 12-cylinders with an included angle of 45 degrees.

Pistons.—The pistons of the Liberty engine are of Hall-Scott design.

Connecting Rods.—Forked or straddle-type connecting rods, first used on the French DeDion car, and on the Cadillac motor car in this country, are used.

Crank Shaft.—Crank shaft design followed the standard 12-cylinder practice, except as to oiling. Crank case follows standard practice. The 45-degree angle and the flange location on the cylinders made possible a very strong box section.

Lubrication.—The first system of lubrication followed the German practice of using one pump to keep the crank case empty, delivering into an outside reservoir, and another pump to force oil under pressure to the main crank shaft bearings. This lubrication system also followed the German practice in allowing the overflow in the main bearings to travel out the face of the crank cheeks to a scupper which collected this excess for crank pin lubrication. This is very economical in the use of oil and is still the standard German practice.

The present system is similar to the first practice, except that the oil, while under pressure, is not only fed to main bearings but through holes inside of crank cheeks to crank pin, instead of feeding to these crank pins through scuppers. The difference between the two oiling systems consists of carrying oil for the crank pins through a hole inside the crank cheek instead of up the outside face of the crank cheek.

Propeller Hub.—The Hall-Scott propeller-hub design was adapted to the power of the Liberty engine.

Water Pump.—The Packard type of water-pump was adapted to the Liberty engine.

Carburetor.—A carburetor was developed by the Zenith Co. for the Liberty engine.

Bore and Stroke.—The bore and stroke of the Liberty engine is 5x7 inches, the same as in the Hall-Scott A-5, A-7, and 12-cylinder engines.

Remarks.—The idea of developing Liberty engines of four, six, eight and 12 cylinders with the above characteristics was first thought of about May 25, 1917. The idea was developed in conference with representatives of the British and French Missions, May 28 to June 1, and was submitted in the form of sketches at a joint meeting of the Aircraft Board and the

Joint Army and Navy Technical Board, June 4. The first sample was an 8-cylinder model, delivered to the Bureau of Standards, July 3, 1917. The 8-cylinder model, however, was never put into production, as advices from France indicated that demands for increased power would make the 8-cylinder obsolete before it could be produced.

Work was then concentrated on the 12-cylinder engine, and one of the experimental engines passed the 50-hour test August 25, 1917.

After the preliminary drawings were made, engineers from the leading engine builders were brought to the Bureau of Standards, where they inspected the new designs and made suggestions, most of which were incorporated in the final design. At the same time, expert production men were making suggestions that would facilitate production.

The Liberty 12-cylinder engine passed the 50-hour test, showing, as the official report of August 25, 1917, records, "that the fundamental construction is such that very satisfactory service with a long life and high order of efficiency will be given by this power plant, and that the design has passed from the experimental stage into the field of proven engines."

An engine committee was organized informally, consisting of the engineers and production managers of the Packard, Ford, Cadillac, Lincoln, Marmon and Trego companies. This committee met at frequent intervals, and it is to this group of men that the final development of the Liberty engine is largely due.

In addition to the above facts, credit might properly be given to Mr. Hunt for the development of the water-jacket system for the Packard aero-engine, and to the Hall-Scott company for the crankshafts, since the dies for the 4- and 6-cylinder Hall-Scott engines were later reworked for that 8- and 12-cylinder Liberty engines, respectively. It may also be added that the Hall-Scott company had completed 4-, 6-, 8- and 12-interchangeable-cylinder engines before the Liberty design was started.

While it is not generally known that 4- and 6-cylinder Liberty engines were designed, the fact appears that they were not only designed but actually made.—*Aviation*, 1/6.

AIR PROPULSION.[1]—By Morgan Brooks, Professor of Electrical Engineering, University of Illinois.—This paper describes experiments with propellers, asserting that the accepted screw theory of air propulsion does not accord with the facts. Air is impelled by a propeller at a speed approaching twice the screw advance for small blade angles, hence the theory of reflection or batting action should replace the screw theory. Thrust is shown to be due in greater degree to velocity and less to blade disk area than is commonly supposed. A method of predicting the complete flying performance of a propeller from a single static test of an accurate model is indicated.

The term airscrew, considered by many writers on aeronautics as descriptive of propeller action, is a misnomer. The theory of the marine propeller, which seems to be adequately presented by the screw principle, has been transferred to air propulsion without sufficient regard for the extreme difference in the two fluids as to elasticity. Imagine automobile tires filled with water. In view of the current theory that air is driven by a propeller with a velocity never exceeding the product of the propeller's pitch and its revolution, it was a surprise to find that air may be driven backward at a velocity nearly twice as great as this product indicates. The fact was so revolutionary as to cause the greatest care in measurement before its acceptance. Recognition of this superspeed action of propellers explains many anomalies of air propulsion and will undoubtedly lead to more exact formulas for thrust and power calculations.

[1] For presentation at the spring meeting, Worcester, Mass., June, 1918, of The American Society of Mechanical Engineers, 29 West 39th Street, New York.

The purpose of this paper is to give proofs of the facts stated, and to point out some of the applications of the superspeed theory as it relates to propellers and blowers.

Superspeed is not observed readily in connection with the standard type of two-bladed propeller, owing to the masking of the effect by the mingling of high-speed air with a much larger quantity of inert air lying between the propeller blades. The measurements were made upon a special type of propeller having extremely short blades of great width, sweeping the entire 360 degrees of the disk area, in fact. It should, perhaps, be stated that with the acceptance of superspeed the definition of slip as "the backward velocity of the current from a propeller" must be abandoned; but another definition of slip, "the shortage of velocity of translation as percentage of propeller screw advance," may survive owing to its convenience.

A propeller of the wide-blade type described having an experimental mean pitch of 2.53 feet, gives a wind on static test that flows 3.33 feet per revolution, regardless of the rotation speed of the propeller. These values were determined for the writer by Prof. E. P. Lesley at the Leland Stanford Junior University wind tunnel, confirming his own measurements. The superspeed ratio, 3.33/2.53, is 1.32, and these figures bear so direct a trigonometrical relation to the blade angle as to suggest that air instead of being swept backward by screw pressure is driven back by precise reflection or batting action.

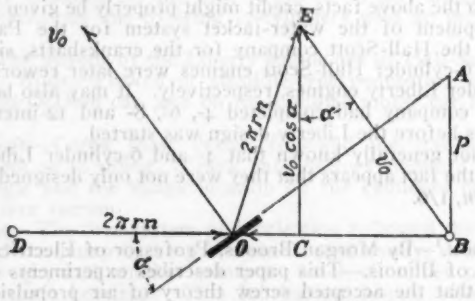


FIG. 1.—Diagram Illustrating Test Conditions for a Wide-Blade Propeller Having a Blade Angle (α) of 36 Degrees.

The diagram, Fig. 1, illustrates nearly to scale the test conditions for the propeller mentioned above having a blade angle, α, of 36 degrees. The blade element indicated at O is moving toward the left at the velocity indicated by the line $BO = 2\pi rn$, around an axis parallel to CE far below the plane of the paper, and strikes an air particle at point D. The relation of particle to blade is unchanged by assuming that the particle D moves to the right at same speed against a stationary blade, and is reflected to point E in unit time. Had the blade not been in the way the particle would have reached B, hence the blade has deflected the particle in the direction BE, represented also by the vector Ov_0 with respect to the plane. Ov_0 is perpendicular to the instantaneous position of the blade when striking the particle. Under the reflection theory assumed, the axial velocity of the air particle is the projection of this vector, that is, $CE = v_0 \cos \alpha = 2\pi rn \sin 2\alpha$. To the same scale BA represents pitch multiplied by revolutions, the accepted air velocity by the screw theory. Since $BA = 2\pi rn \tan \alpha$, the ratio of superspeed velocity to screw-pitch velocity is $CE/BA = 2 \sin \alpha \cos \alpha / \tan \alpha = 2 \cos^2 \alpha$. For the 36-degree angle of the special test propeller this ratio, since $\cos 36° = 0.81$, is 1.31, which agrees with the value 1.32 experimentally determined by pitot-tube measurement with sufficient precision

to warrant acceptance of the reflection theory, especially when similar close agreement was found with a blade of 28-degree angle and by other confirmatory tests.

To illustrate the more complex condition of a propeller operating on a flying plane or in a wind tunnel with corresponding wind conditions, Fig. 2 is offered. Here, as before, the blade instead of rotating to the left at the velocity $2\pi rn$, is assumed stationary, and the air particle at G is assumed to move to the right at the velocity $2\pi rn$, combined with the velocity V_0, also reversed, representing the plane's translational velocity, or, in the case of a wind tunnel, that of the impressed wind. In unit time the particle moves along the diagonal path Z, strikes the blade at O, and is reflected to E. The angle of incidence and of reflection is $\alpha - \beta$. But for the blade the particle would have reached B in the same time, so that the blade action is represented by BE, while under the screw theory the motion would be BA, the slip, which is more clearly indicated as S at the left of the diagram. The axial projection of BE is $BE \cos \alpha$, not represented in the diagram,

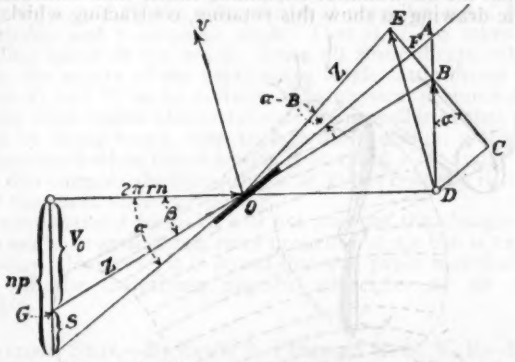


FIG. 2.—Diagram Illustrating Test Conditions for a Propeller Operating on a Flying Plane or in a Wind Tunnel.

and the ratio $BE \cos \alpha / BA = 2 \cos^2 \alpha$, the same ratio as found for static test conditions. This relation is derived as follows:

$$BE = 2FE = 2Z \sin (\alpha - \beta) = 2Z (\sin \alpha \cos \beta - \cos \alpha \sin \beta)$$

but

$$Z \cos \beta = 2\pi rn = np \cos \alpha / \sin \alpha$$

and

$$Z \sin \alpha = V_0$$

hence

$$BE = 2 \cos \alpha (np - V_0)$$

and

$$BE \cos \alpha = 2 \cos^2 \alpha (np - V_0).$$

Thus either for static or flying tests an air propeller produces a velocity or a change in velocity which has a superspeed ratio of $2 \cos^2 \alpha$ as compared with the screw-advance theory. This factor varies from nearly 2 for low pitch angles found near the blade tip to 1 for a 45-degree angle, the steepest blade angle for effective work in propellers. For a propeller of constant pitch equal to diameter, a normal design, the superspeed ratio is 1.8 for the blade tip and 1.4 at half radius. Since the activity of propellers is confined mostly to the outer half of the blades, normal values for superspeed would lie usually between 1.5 and 1.6.

In wind-tunnel tests, where alone velocities of the air can be measured satisfactorily, the propeller activity BE is combined vectorially with the

wind velocity V_0, making the vector DE, represented also by Ov, the velocity to be measured. The difference between this and $DA = np$ is not very marked, except at rather heavy slip conditions. For low blade angles, however, where the superspeed ratio is more pronounced, careful speed measurements show that the air leaves the propeller at higher velocities near the blade tips than part way in, a condition inconsistent with the screw theory for standard-type constant-pitch propellers. Eiffel's "Recherches" presents an elaborate collection of data showing this condition to exist, for which no explanation is offered, but the reflection theory explains it.

When the direction of the air flow from a static propeller is investigated by means of light ribbons, they show that the air moves in a direction strictly perpendicular to the blade angle, the condition demanded by the reflection theory but not by screw action. Moreover, these ribbons indicate that the stream contracts in diameter slightly as it leaves the propeller with its rotating whirl, whereas with the squeezing action of a screw it would be expected that the air would be expanding rather than contracting. Fig 3 is an isometric drawing to show this rotating, contracting whirl.

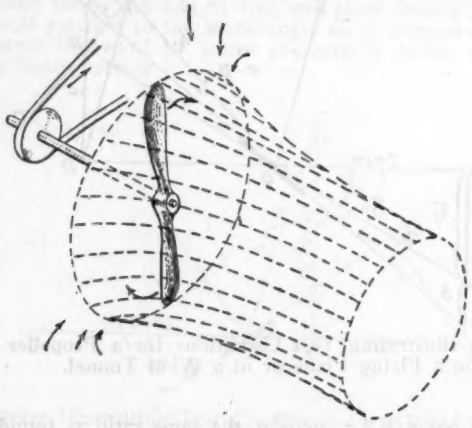


FIG. 3.—Sketch Showing Direction of Air Flow From a Static Propeller.

The most convincing demonstration of the velocity of air leaving a propeller faster than the propeller screw advance is found in a test made with two propellers connected in tandem, illustrating a wind-tunnel test. Calling the forward propeller a blower, for distinction, assume that it provides a wind at 30 miles per hour, or 44 feet per second, and that the propeller is driven in this wind at a speed just above idling speed, such that its revolutions times pitch is, say, 48 feet per second. An anemometer shows a velocity of about 50 feet per second. If now the blower be shut down, while the speed of the propeller is maintained constant, the wind velocity rises to 75 feet per second instead of remaining constant as demanded by the screw theory.

Accepting superspeed, then, it is seen that since the air is driven backward at an excess rate, the thrust due to this unexpected acceleration is, by the Newtonian laws of dynamics, due in greater degree to speed and less to the quantity of air handled than is commonly supposed. It has long been recognized that the evaluation of dynamic thrust equations requires the questionable assumption of blade activity over a larger portion of the propeller disk than that covered by the blades alone. Indeed some authorities, such as Riach,[1] use the entire disk area as that actuated by the

[1] Efficiency Variation in Airscrews, *Aviation*, April 1, 1918.

propeller. Seventy-mile flight at 30 per cent slip is commonly supposed to mean that the air is driven backward at 30 miles per hour, while its actual speed is nearer 50 miles per hour. This means that the column of air with respect to the plane is not 100 miles but about 120 miles per hour in length. No wonder it is difficult to get satisfactory results from air-dynamics formulæ now in use, except from well-developed empirical formulæ.

The proper interpretation of superspeed bids fair to reconcile the thrust and power values as derived from the static tests with those of wind tunnels or of flight, whereas it seems to be the common opinion to-day that flying performance cannot be predicted from static tests. With the precise air-dynamics formulæ sure to come, a single static test of a propeller should furnish all necessary data for the production of complete flying-performance curves.

As a preliminary empirical approximation the following formula may prove useful: $T = T_0 - T_0'$, where T is flying thrust, T_0 the static thrust at propeller speed n, and T_0' the static thrust at propeller speed V/p, where V is plane velocity and p propeller pitch. That is, T_0' is taken statically at what is idling speed in the wind. Since all static-thrust values are proportional to the square of the rotations, a single static thrust at any speed enables both T_0 and T_0' to be derived. The physical meaning of this seems to be that the wind-tunnel blower relieves the propeller of that portion of T_0 represented by idling speed, even though the propeller, giving superspeed, sends air backward when tested statically at speed V/p, faster than velocity V. Under this formula the flying thrust at 30 per cent slip is found to be 51 per cent of the static thrust at speed n.

Correct air-dynamics formulæ will not produce the changes in propeller design that might be anticipated, since propeller, or air bat, is extraordinarily efficient to-day. However, it is hoped that this paper may lead to a clearer conception of the underlying physical principles of air propulsion.—*Aviation*, 6/1.

ON A BALLOON SHIP.—By Lewis R. Freeman, R. N. V. R.—I had crossed on the old *Xerxes* in those ancient days when, as the latest launched greyhound of the Cunarder fleet, she held for a few precarious months the constantly shifting blue-ribbon for the swiftest transatlantic passage; but in that angular "cubistic" lump of lead-grey looming over the bow of my spray-smothered launch to blot out the undulant skyline of the nearest Orkney, there was not one familiar feature. Her forward funnel had been "kippered" down the middle to somewhere about on the level of the lower deck, and carried up in two smaller stacks which rose abreast to port and starboard. This had been done (as I learned later) to make room for a platform leading forward from the waist over which seaplanes could be wheeled to the launching-stage, which ran out over the bow from beneath the bridge. The break in the forecastle had been closed in in connection with a sweeping alteration which had converted the whole forward end of the main deck into a roomy seaplane "repository" and repair shop.

The changes aft were no less startling. The old poop seemed to have been razed to clear the last 200 feet of the main deck, and over the 10 to 15-feet-high railing, which surrounded this, the top of a partly inflated observation balloon showed like the back of a half-submerged turtle. The whole effect was weird and "impossible" in the extreme, and I felt like exclaiming with the yokel who saw a giraffe for the first time: "Aw, there ain't no such animal."

I had been asked aboard the *X*——— for an afternoon of seaplane and balloon practice. I had already seen a good deal of the former at various points in the Mediterranean and Adriatic, but the towed observation balloon—the "kite," as they called it—was an entirely new thing. I "put in" at once for an ascent in a kite, for I was anxious not only to get some sort of a first-hand idea of how it was being employed against submarines—

of which I had already heard not a little—and also to compare the work with that of handling the ordinary observation balloons, of which I had seen so much in France, Italy, and the Balkans. The captain—whom I found just getting the ship under weigh from the bridge—after some hesitation, promised to "see what he could do," if there was not to much wind, when he was ready for "balloon work."

To one who has had experience only of hangars on land, perhaps the most impressive thing about an "aeroship" is the amount of gear and equipment which can be stowed and handled in restricted spaces. Wings and rudders which fold and refold upon each other until they form compact bundles that can be trundled about by a man or two, collapsible fuselages and pontoons, wheels which detach at a touch of a lever, "knock-down" transmissions—these things were everywhere the rule. One "baby" scout I saw also completely assembled on the launching-stage, and the "tail," which a couple of men wired to the main body in little more than a minute, I would have sworn I could have knocked off with a single well-placed kick. Yet, five minutes later, I saw that the same machine "loop," "side-flop," "double-bank," and (quite at the will of its young pilot, who is rated the most expert seaplane man in the British Naval Air Service) recover at the end of a 500-foot rolling fall, all without apparently starting a strut or rivet. "Collapsibility" and portability are evidently secured without sacrificing any essential strength.

The science of working the seaplane from the deck of a ship is still in process of development. Even up to quite recently it was the practice to put a machine overboard on a sling, and allow it to start from the water. The use of detachable wheels—which fall off into the sea after they have served their purpose in giving the preliminary run—has made launching from the deck practicable and comparatively safe, but the problem of landing even a wheeled machine on deck has not yet been satisfactorily solved. On account of lack of room, most of the experiments in this direction have ended disastrously, even tragically.

When a seaplane is about to be launched, after the usual preliminary "tuning" up on the launching-stage, the ship is swung dead into the teeth of the wind and put at full speed. This matter of wind direction is very important, for its variation by a fraction of a point from "head-on" may easily make a crooked run and a fluky launching. As the latter would almost inevitably mean that both plane and pilot must be churned under the swiftly advancing fore-foot of the ship, no precautions calculated to avoid it are omitted. Besides a wind-pennant at one end of the bridge, assurance is made doubly sure by the turning on of a jet of steam in the mathematical center of the extreme tip of the launching-stage. When the back-blown steam streams straight along the middle plank of the stage the wind is "right."

The captain, from the bridge, lifts a small white flag as a signal to the wing-commander that all is ready. The latter nods to the pilot, who starts his engine at full speed, while two mechanicians, braced against cleats on the deck, hold back the tugging seaplane. If the "tone" of the engine is right, the wing-commander (standing in front of the plane, and a little to one side) brings down his red-and-yellow flag with a sharp jerk, falls on his face to avoid a collision, and the machine, freed from the grip of the men holding it, jumps away. The next two seconds tell the tale, for if a seaplane "gets off the deck" properly, the rest of its flight is not likely to be "eventful."

Practice Flights.—At practice, a seaplane sails over and drops its detachable wheels near a waiting drifter, which picks them up and returns them to the ship. The machine swoops low, and "kicks" loose the "spares" at a hundred feet or less above the surface of the water, and a pilot who let his wheels go from a considerably greater altitude drew a growl from the bridge, as a long fall is likely to injure them. Its flight over, a seaplane returns to the ship by alighting on the water several hundred yards astern,

and floundering up alongside as best it can. With a high wind and a choppy sea, it is rough work. The machine is so "balanced" that its tractor propeller should revolve in the air and clear the water by several inches, even in a rough sea. It will occasionally strike into "green water," however, which is always likely to shatter the ends of the blades, if nothing else. The sheathing of the blades with metal affords considerable protection, though a certain risk is always present. The operation of picking a seaplane up and hoisting it aboard is a nice piece of seamanship at best, but in bad weather is a practicable impossibility. With the wind much above 30 miles an hour, indeed, only a very real need is likely to induce a "mother ship" to loose her birds from the home nest. With the sea too rough to make it possible for a seaplane to live in it, it is sometimes possible to carry on imperative reconnaissance by sending up an ordinary aeroplane (some of which are always carried); though the latter must, of course, make its landing on *terra firma* when its work is over.

The wind had been freshening considerably all afternoon, but with no more than 30 miles an hour showing on the indicator, there was no reason for not letting me have my "balloon ride."

As the time approached for its ascent, the balloon was allowed to rise far enough from the deck to permit its car to be pushed underneath the center of it, in order that the latter might not be dragged in the "getaway." I could now see that the monster had rather the form of the "bag" of an airship than the "silkworm-with-stomach-cramps" shape of the regulation modern observation balloon. Its nose was less blunt than that of the "sausage," and the ropes were attached so that it would be pulled with that nose boring straight into the wind, instead of tilted upwards like that of its army prototype. The three "stabilizers" at its stern were located, and appeared to function, similarly with those of the "sausage."

The basket was mid-waist deep, and just big enough to hold comfortably two men sitting on the strips of canvas which served as seats. Supplementing our jackets, two small life-preservers of the ordinary type were lashed to the inside of the basket. When I asked about parachutes, I was told that, while it was customary to carry them, on this occasion—as they were worse than useless to a man who had not practised with them—it was best not to bother myself with one. "Stick to the basket if anything happens," some one said; "it will float for a month, even if full of water." Some one else admonished not to blow up my jacket until we had stopped rising, lest it (from the expanding air, I suppose) should in turn blow me up. Then we were off. The last thing I noticed on the deck was the ship's cat, which I had observed a few moments previously rubbing his arched back ecstatically against a sagging "stabilizer," making a wild leap to catch one of the trailing guide-ropes.

"He always does that," I heard my companion saying behind me. "Some day perhaps he will catch it, and then—if it happens at a time when there isn't an opportunity to wind in and let him down easy—I'm afraid there won't be a one of his nine lives left in the little furry pan-cake it will make of him when he hits the water. It's surprising how the water will flatten out a—anything striking it at the end of a 1000-foot fall. Only week before last—"

To deflect the conversation to more cheering channels, I began to exclaim about the view. And what a view it was! The old *Xerxes* was lying well down towards one end of the mighty bay, so that without turning the head one could sweep the eyes over the single greatest unit of far-reaching might in the whole world-war, the grand fleet of the British Navy. And in no other way than in ascending in a balloon or a flying machine could one attain a vantage from which the whole of the fleet could be seen. Looking from the loftiest fighting-top, from the highest hill of the islands, there was always a point in the distance beyond which there was simply an amorphous slaty blur of ships melting into the loom of the encircling islands. But now those mysterious blurs were crystallizing into definite

lines of cleavage, and soon—save where some especially fantastic trick of camouflage made one ship look like two in collision, or played some other equally scurvy trick on the vision—I could pick out not only battleships, but cruisers, destroyers, submarines, ranged class by class and row on row. Even the method in the apparent madness with which the swarms of supply ships, colliers, oilers, trawlers, and drifters were scattered about was discernible.

An Average Day.—Save for the visibility, which was diamond-clear in the slanting light of the low-hanging winter sun, it was just an ordinary, average grand fleet day. A squadron of battleships was at target practice, and—even better than their own gun-control officers—we could tally the foam-jets of the "wides" and "shorts" and the narrowing "straddles." A squadron of visiting battle-cruisers had just come to anchor and were swinging lazily round to the tide. Two of them bore names which had echoed to the ends of the world; the names of two of the others—from their distinctive lines and great size, I recognized them as twin giants I had seen still in the slips on the Clyde scarcely a year previously—the world has never heard. A lean, swift scout-cruiser, with an absence of effort almost uncanny, was cleaving its way out toward the entrance just as a line of destroyers came scurrying in after the rolling smoke-pall the following wind was driving on ahead of them. Out over the open seas to the east, across the hill-tops of the islands, dim bituminous dabs on the horizon heralded the return of a battleship squadron, the unceremonious departure of which two days previously had deprived me of the last two courses of my luncheon. In the air was another "kite"—floating indolently above a battleship at anchor—and a half-dozen circling aeroplanes and seaplanes. Countless drifters and launches shuttled in and out through the evenly lined warships.

We were now towing with the cable forming an angle of about 60 degrees with the surface of the water, and running up to us straight over the port quarter. The ship had thinned down to an astonishingly slender sliver, not unsuggestive of a speeding arrow whose feathered shaft was represented by the foaming wake.

"She's three or four points off the wind," commented my companion, "and yet—once we've steadied down—you see it doesn't make much difference in the weather we make of it. A head wind is desirable in getting up to keep from fouling the upper works amidships, but we hardly need to figure it down to the last degree as in launching a seaplane. When we're really trying to find something, of course, we have to work in any slant of wind that happens to be blowing. The worst condition is a wind from anywhere abaft the beam, blowing at a faster rate than the towing ship is moving through the water. In that case, the balloon simply drifts ahead to the end of its tether, swings around, and gives the ship a tow. If the wind is strong enough—say, 40 miles an hour, with the ship doing 20—to make her give a good steady pull on the cable, it is not so bad; but when it is touch-and-go between ship and wind the poor old 'kite' is all over the shop, and about as difficult to work in as to ride in—which is saying a good deal."

"What do you mean by work?" I asked.

"Looking out for things and reporting them to the ship over the telephone," was the reply. "Perhaps even trying to run them down and destroy them."

"Can't we play at a bit of work now?" I suggested. "Supposing we were at sea, and you saw what you thought to be the wake of the periscope of a U-boat a few miles away. What would you do?"

My companion laughed. "Well," he said, "if I had the old *Xerxes* down there on the other end of the string, I should simply report the bearing and approximate distance of the periscope over the telephone, and let her do the rest."

"And what would 'the rest' consist of?" I asked.

"Principally of turning tail and running at top speed for the nearest protected waters," was the reply, "and incidentally 'broad-casting a wireless' giving position of the U-boat and the direction it was moving in."

"But supposing it was a destroyer we had 'on the string'?" I persisted; "and that you had no other present interest in the world beyond the finding of one of these little V-shaped ripples. The *modus operandi* would vary a bit in that case, wouldn't it?"

"Radically," he admitted. "I would give the destroyer what I figured was the shortest possible course to bring her into the vicinity of the U-boat. As long as the wake of the periscope was visible, I would correct that course from time to time by ordering so many degrees to port or to starboard, as the case might be. As soon as the periscope disappeared—which it would do, of course, just as soon as the eye at the bottom of it saw the 'kite'—I would merely make a guess at the submarine's most likely course, and steer the destroyer to converge with that. Our success or failure would then hinge upon whether or not I could get my eye on the submarine where it lurked or was making off under water. In that event—provided only there was enough light left to work with—it would be long odds against that U-boat ever seeing Wilhelmshaven again. Just as you guide a horse by turning it to left or right at the end of a rein, so, by giving the destroyer a course, now to one side, now to the other, until it was headed straight over its prey, I would guide the craft at the other end of the telephone wire to a point from which a depth charge could be dropped with telling effect. If the conditions were favorable I might even be able to form a rough estimate of the distance of the U-boat beneath the surface, to help in setting the hydrostat of the charge to explode at the proper depth. If the first shot fails to do the business, we have only to double back and let off another. Nothing but the coming of night or of a storm is likely to save that U-boat once we've spotted it.

"Is it difficult to pick up a submarine under water?" I asked.

"That depends largely upon the light and the amount of sea running," was the reply. "Conditions are by no means so favorable as in the Mediterranean, but, at the same time, they are much better than in some other parts of the North Sea and the Atlantic. The condition of the surface of the water also has a lot to do with it. You can see a lot deeper when the sea is glassy smooth than when it is even slightly rippled. Waves tossed up enough to break into white-caps make it still harder to see far below the surface, while enough wind (as to-day) to throw a film of foam all over the water cuts off the view completely. On a smooth day, for instance, a drifter which lies on the bottom over there—deeper down than a U-boat is likely to go of its own free will—is fairly clearly defined from this height. To-day you couldn't find a sunk battleship there."

I remarked on the fact that, in spite of the heavy wind, our basket was riding more steadily than that of any stationary observation balloon I had ever been up in at the front. "It 'yaws' a bit," I observed, "but I have never been up in a balloon with less of that 'jig-a-jig' movement which makes it so hard to fix an object with your glasses."

"The latest 'stabilizers' have just about eliminated the troublesome 'jig-a-jig,'" replied my companion.

He turned to me with a grin. "You're in luck," he said. "Ship's heading up into the wind to let a seaplane go just as they're ready to wind us in. You'll learn, now, why they call one of these balloons a 'kite.' There they go! Hold fast!"

There was a sudden side-winding jerk, and then that perfectly good seascape—grand fleet, Orkneys, the north end of Scotland, and all—was hashed up into something full of zigzag lines like a futuristic masterpiece or the latest thing in "scientific camouflaging." My friends on the deck told me, afterwards, that the basket did *not* "loop-the-loop," that it did *not* "jump through," "lie down," and "roll over" like a "clown" terrior in a circus; but how could they, who were a thousand feet away, know

better than I, who was on the spot? When I put that poser to them, however, one of them replied that it was because *they* had their eyes open. The only sympathetic witness I found was one who admitted that, while the "kite" itself behaved with a good deal of dignity, the basket *did* perform some evolutions not unremotely suggestive of a canvas water bucket swung on the end of a rope by a sailor in a hurry for his morning "souse."—*Land and Water*, 4/4.

TYPES OF MILITARY AIRPLANES.[1]—*The Possibilities of the Bomber.*—By Col. V. E. Clark.—The military types of aeroplanes, as influenced by the military functions and as influencing the design of the engine that goes into the aeroplanes, will be the subject of this brief discussion.

The Allies have run to more types than the enemy. One of the main reasons for this is that the Allies have listened more to the demands of their fliers, who have exerted much influence on plane and engine design. Thereby, standardized production has been sacrificed to individual requirements.

It will be America's part in the aircraft program to select those types that best lend themselves to big production—to look ahead six or twelve months in an endeavor to anticipate the advance requirements, and then design those types in such a way that they can be built on a large scale. Standardization means fewer types—greater numbers of machines. We must select perhaps five or six types, develop them, and *produce* them by the thousands. We should select for standardization from the following types:

(1) Airplanes of observation.
(2) Aeroplanes of combat and pursuit.
(3) Aeroplanes of destruction and harassment.
(4) Special types.

None of these types is new. All can be developed to a far greater degree of efficiency than those now being used. Each type has a different function. Aeroplanes of observation must aid the army on the ground in successfully performing its operations. Those of combat and pursuit must prevent enemy aircraft from doing damage in any way. Those of destruction and harassment will inflict direct damage on the enemy. With special types we have little concern. Of chief concern to me—to the Aircraft Board—to America—in fact, to the world, are those planes that will inflict direct damage on the enemy. They are the bombing machines, upon which depends a substantial part of the measure of victory, of that I am convinced.

The need for these being recognized and vital, and the hour of their initial production being at hand, I shall confine my remarks to a limited discussion of their possibilities.

Bombing operations provide practically all the real damage that it is, at present, possible for an aeroplane to inflict upon the enemy. In comparison to these the slight damage caused by bringing down his aeroplanes, each containing one or two men only, or shooting up his trenches or truck trains, is negligible.

The enemy should be harassed continually from the air. Two classes of bombers must be employed—day bombers and night bombers.

Use of Day Bombers.—Under present conditions along the western front *material* damage must be done at night. Day bombers will be used solely for the moral effect of inflicting perpetual unrest except in a few special cases when vulnerable objectives are difficult to locate at night.

The primary military functions of the day bomber are:

(1) To bomb important points, such as small objects difficult to find by night, headquarters, small ammunition "dumps," small storehouses containing munitions or supplies, small railway junctions, and small aerodromes.

[1] A paper presented at the annual meeting of the Society of Automotive Engineers and published in the *Journal* of the Society.

(2) To bomb such communities as is considered desirable, especially factories and factory towns.

(3) To conduct long-range reconnaissance, strategical reconnaissance, reconnaissance by staff officers, or with camera.

(4) To do special photographic work so far beyond the lines as to necessitate great altitude, demanding a camera of great focal length and therefore great size and weight.

The primary requirements for this aeroplane in order that it can effectively perform its military functions are:

(1) Ability to protect itself effectively against all hostile aircraft, which demands good speed at altitude, strong climbing ability, powerful and reliable armament, and a satisfactory degree of "handiness."

(2) Reliable power-plant.

(3) Power-plant with good fuel efficiency.

(4) Capacity for as many bombs as will not prohibit satisfactory provisions for protecting itself against enemy aircraft as discussed above. I believe that, at the present time, it is not an economic proposition to send a trained pilot and a trained "bombardier" a great distance beyond the enemy's line unless at least 600 pounds of bombs are carried.

(5) Effective provision for accurate sighting of and dropping bombs.

(6) Ceiling should be high enough so that the machine stands a good chance of escaping detection as it crosses the line.

(7) Muffler for the exhaust capable of being cut in and off at the will of the pilot.

(8) Two or three machine guns, one firing through the propeller disk and one or two will all-around fire, with good field to the rear.

(9) Provision to carry two men.

(10) Reliable compass.

Typical aeroplanes of the day bomber type are the DeHaviland-9 (British), with 300-hp. Fiat engine; the S. I. A. 7-B (Italian), with 200-hp. Fiat engine; the S. I. A. 9-B (Italian), with 500-hp. Fiat engine, and the Breguet 14-B2 (French), with 300-hp. Renault engine. The German Gotha twin-engine machine (two 260-hp. Mercedes engines), while rather too slow and too unhandy for the purpose, has done some service bombing by day over London.

Night Bombers.—The type designed for bombing by night, in my opinion, must be depended on to inflict real material damage upon the enemy. I believe that the consistent employment of these machines in large numbers on every good moonlight night to bomb Germany's munition factories, factory towns, important railway junctions, large munition depots, the bridges across the Rhine, the Kiel Canal, important docks, submarine bases, and certain cities, would end the war in a shorter period of time than is possible by any other means.

The primary requirements for these machines in order that they can effectively perform their functions are:

(1) The great bomb capacity.

(2) Reliable power-plant.

(3) Power-plant with good fuel efficiency.

(4) Proper degree of stability and controllability to permit a pilot of ordinary ability, and a limited amount of training to fly and land at night.

(5) Effective provision for accurate sighting for, and dropping of bombs.

(6) Accurate compass and other instruments necessary for navigation by night, with provision for reading conveniently at night.

(7) Provision for carrying two to five men. Probably the best practice is a crew of three, a chief pilot, a "bombardier," and one man to man a gun forward or to the rear, as may be necessary, and to act as relief pilot.

The load of bombs that can be carried will depend upon the total power available at an altitude of 10,000 feet, and upon the distance of the objective (which will regulate the initial fuel supply). The ratio of total weight of aeroplane, with full initial load, to the total power available should be small enough to permit a ceiling of at least 11,500 feet, starting with full

load. The power plant will be divided into two or possibly three units. Suppose that two U. S. A. twelve-cylinder engines be installed; if no device is incorporated to maintain the power constant with change in altitude, the total power available at 10,000-feet altitude should be about 450 horsepower. Suppose that the objective lies 155 miles beyond the lines, a bomb load of between 2000 and 2700 pounds can be carried, and the necessary initial ceiling obtained, provided the general design of the aeroplane be good.

Limiting Weight.—The total weight of the aeroplane in pounds with full initial load should not be more than 22 times the number of horsepower available at 10,000 feet. The total weight should not be more than 5.63 pounds per square foot. The machine should have possible horizontal speed, at an altitude of 10,000 feet of not less than 85 miles per hour. Starting with full load the aeroplane should be capable of climbing to an altitude of 10,000 feet in not more than 27 minutes. For every 16 miles increase in radius necessary to reach the objective, 100 pounds of bombs are sacrificed.

Typical aeroplanes of the night bomber type are the Caproni triplane (Italian) with three 273-hp. Isotta-Fraschini engines; the Handley-Paige (British) with 320 hp. Sunbeam engines, and the Caproni biplane with three 210-hp. S. P. A. engines. The German Gotha, with two 260-hp. Mercedes engines, is typical.

The number of night-bombing aeroplanes built and supplied should depend solely upon the number of pilots available for this work. A far lower degree of flying skill is required to pilot a large slow night bomber than for a fast fighting machine, although more mature judgment is necessary.

As a matter of fact, the number built and supplied will, in all probability, eventually depend upon steamship space for trans-Atlantic transportation and upon the hangar space at the aerodrome in France, and possibly upon the appropriation available.

Air Raids with Bombs.—Consider, for example, a fleet of several hundred of night-bombing aeroplanes, each carrying a ton and a half of bombs, flying from large aerodromes located say 25 miles to the rear of the line. The fleet penetrates to Essen, for instance. Each machine locates its objective and drops ten 160-pound bombs of the high-explosive type on the factories and forty 25-pound bombs filled with poisonous gas, and twenty-four 25-pound bombs of the incendiary type throughout the factory town, and returns home.

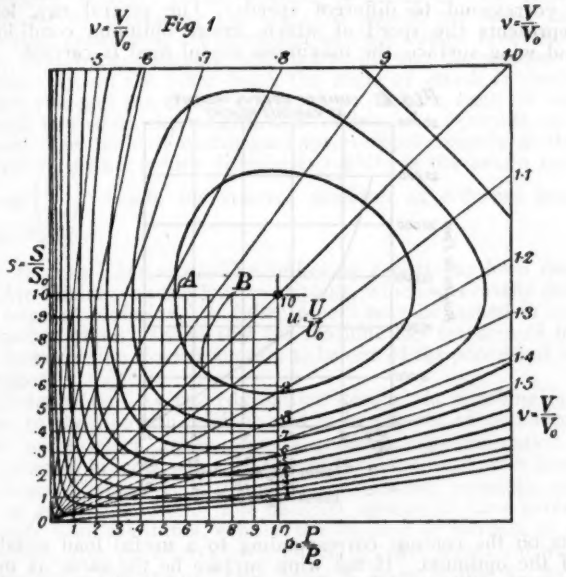
In the existing phase of the present war were our night-bombing aeroplanes of sufficient numerical strength it would be no longer a matter of individual and isolated raids on selected places at which the maximum of injury could be inflicted, but rather a continuous and unrelenting attack on every point of strategical importance.

Depots of every kind in the rear of the enemy's lines would cease to exist; rolling stock and mechanical transport would be destroyed; no bridge would be allowed to stand for 24 hours; railway junctions would be subject to continuous bombardment, and the lines of railway and the roads themselves broken up nightly by giant bombs to such an extent as to baffle all attempts to maintain or restore communication.

In this manner a virtually impossible zone would be located in the rear of the enemy defenses, a zone varying from 100 to 200 miles in width. As soon as this condition has been brought about, the position of the defending force must be considered as precarious, and eventually impossible. The defense will be strangled from the uncertainty and lack of supplies of all kinds. Ultimately retreat will become impossible. The defending force will find itself in a state of siege under the worst possible conditions. Its position will be in the form of an extended line along which the forces of all arms will be definitely immobile, for the lateral communications will suffer no less than the lines from the rear. In short, a reign of terror would exist. Such a condition presents all the elements conducive to complete and irreparable disaster.

Everyone here, I think, will realize that even consistent bombing of factory towns would end the war surely and quickly.—*Scientific American*, 25/5.

AEROPLANE LIMITS.—It is a commonplace of bridge engineering that there is a fixed limit to the length of span possible with a given type, since the weight of the structure goes up rapidly as the span is increased, and at some limit of span becomes so large that the bridge would break down under its own deadweight acting alone, even without the added burden of the traffic to be accommodated. The limiting useful span is that at which the stresses due to the weight of the structure plus that of the traffic reach the safe limit, and an increase of span beyond this is impracticable without a change either in the type of bridge or in the materials with which it is made. The supporting surfaces of an aeroplane are subject to the same law—that their weight increases with increase of dimensions more rapidly than their strength does, and this would in itself

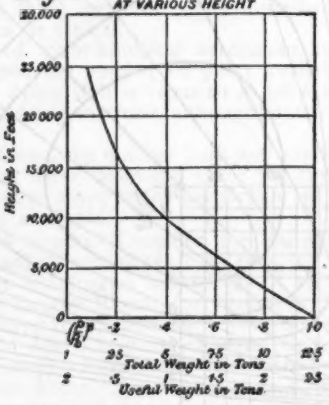


suffice to fix a limit to the possible size of aeroplanes. Matters are, however, still worse when allowance is made for the fact that level flight is impossible without engine power, and hence, before the wings can carry any useful load whatever they must be able to support not only their own weight and that of their essential structural elements and connections, but also that of the engine. It is thus only the balance of sustentation left after deduction for these that is available for supporting the useful load, which will include the weight of the crew and of all other weights which are not in the shape of fixtures or engine supplies.

In a recent issue of *The Aeronautical Journal* Lieutenant A. R. Low, R. N. A. S., has given some interesting curves showing how the useful load in any machine will vary if the conditions differ in any way from the optimum. In a paper read before the Junior Institution of Engineers in April, 1913, he established rational relationships between the useful load carried and the engine weights, the structural weights, and the coefficients of sustentation and of resistance, and from these he has now plotted the curves reproduced in Fig. 1. These curves are applicable to any and

every aeroplane, and show at sight how with a given type the performance will vary with changes in the engine power, wing surface and speed. For every type there is, in fact, some one combination of power surface and speed which is most effective, as estimated by the useful load carried. Thus let P_0 denote the power expended under these conditions, and S_0 the corresponding wing surface, whilst V_0 denotes the speed, then if U_0 be the useful load then carried, the relation between these various quantities at any other load is deducible from the curves plotted in Fig. 1. The isolated central point of the diagram represents the conditions corresponding to the maximum possible load. This can be carried only at one speed and with one power. If the power be increased beyond this value the consequent increase in engine weights will diminish the possible useful load carried. These useful loads are plotted as contour lines, of which that corresponding to the optimum conditions is represented by the central point of the diagram, whilst other loadings are represented by the numbered curves. The lines shown as radiating from the lower left-hand corner of the diagram correspond to different speeds. The central ray, lettered as $v=1$, represents the speed at which, under optimum conditions as to power and wing surface, the maximum useful load is carried. A and B

Fig. 2. LIMIT OF USEFUL WEIGHT AT VARIOUS HEIGHT



are points on the contour corresponding to a useful load equal to nine-tenths of the optimum. If the wing surface be the same as in the best conditions, then this useful load of nine-tenths will be carried with an expenditure of only about 0.56 of the power required at the maximum useful effect, and this reduction of the power by 0.44 will reduce the speed by about 0.18 only. The reduction of power is shown by the point where the contour 0.9 cuts at A the horizontal line through the center of the figure. By reducing the surface to about two-thirds of its optimum value, this same load of nine-tenths of the maximum can be transported at the same speed of the machine as in the optimum conditions with an expenditure of about two-thirds of the power required to carry the maximum load. This is indicated by the point B, where the contour 0.9 cuts the ray $v=1$. Similar conclusions follow when the useful load is still further reduced, as is clearly shown by the corresponding contour lines. In general, aeroplane practice lies wholly within the lower left-hand quarter of the complete diagram. In some cases, however, it has been found desirable, for certain purposes, to go outside these limits, which is accomplished by reducing the fuel and oil supplies carried. The useful load can in that case be increased, but the length of flight possible is, of course, diminished. The curve shown in Fig. 2 represents, Lieutenant Low states, about the

maximum useful loads with which flight is now possible at the different levels indicated, though there are indications that improvements in materials and in the design of details may ere long yield results better than those represented by the curve. The numerical results merely represent the machine ideally possible on the basis of the data of 1912, and though the limits indicated by the curve have only now been reached after five years of exceptionally rapid progress, they must not be taken as final. Every reduction in engine and structural weights obtained by better design or by cutting factors of safety puts up the value of the useful weight carried nearly as the square of the value of the improvement. The curve has been plotted on the basis that the fuel tanks are full, carrying the normal supply of petrol. The heights shown are the "ceiling" heights of the machines with different weights on board. As a machine rises, the density of the air diminishes and its sustaining power falls off. The ceiling height of a machine is the limit to which it is possible for the machine to climb. At this limit the machine can just fly horizontally when developing its maximum engine power. If an attempt be made to rise above this "ceiling" height by increasing the angle of attack, the speed falls off because the head resistances are increased and the engine revolutions and horse power diminish accordingly, with the result that the machine begins to come down. If, on the other hand, the angle of attack is diminished, the speed will rise and the engine power go up, but the angle of attack is then too small to sustain the weight, and the machine descends, as in the previous case. The limit of useful load varies approximately as the cube of the density of the air, which diminishes rapidly as the height increases. The abscissæ $\left(\frac{\rho}{\rho_0}\right)$ denote the relative densities at different heights.—*Engineering*, 25/5.

THE 1917 FOKKER TRIPLANE.—The following report has been issued by the British Air Ministry on the Fokker triplane, which was briefly described in the last issue of *Aviation*. A fuller report may be issued in the near future, if further inquiry shows that the machine has features of interest. At present, however, the Fokker appears to be one of the poorest of modern German designs.

General Description.—As regards outline design, the machine is somewhat similar to the Sopwith triplane and is in general of orthodox type. The chief point which arises from a preliminary examination is the absence of external bracing wires. This point will be dealt with later.

Constructional Design.—It is from this standpoint, probably, that the machine is of greatest interest. The designer appears to have made every effort to reduce head resistance, even at the expense of increase in weight. In some respects, also, his efforts have tended to grave structural weakness.

Wing Structure.—The unique "twin" spar is shown in Fig. 3. It consists of two box-section tapering spars joined by transverse ply-wood. As far as can be gathered at present, the fore and aft shear strength of this built-up member is supplied by one port and one starboard bulkhead of ply-wood in each plane. This appears quite inadequate, especially in a high-speed machine, even if we disregard the possibility of buckling of the laterally unstabilized ply-wood in nose-diving.

Apart from this point, the internal wing structure presents no peculiarities. From the front spar to the leading edge, the upper surface is stiffened with ply-wood as is usual on many modern scouts.

The nature of the main cellule structure is a typical example of the high price paid for reduction of resistance. Interplane wiring is dispensed with, and structurally the main frame may be regarded as three pairs of cantilevers, tied by pseudo-struts near the wing tips.

On a machine of relatively short span this cantilever construction may be rendered possible by the use of spars of great depth, and the ply-wood box type employed meet this condition, owing to the abnormally high

thickness-chord ratio of the aerofoil section. It is questionable whether the gain in overall efficiency by deletion of bracing wires is sufficient to balance the loss due to the use of a "high lift" section; this question naturally becomes more acute at high speeds, especially when the altitude is not approaching the ceiling; it is also rendered acute by the abnormally small gap-chord ratio employed.

The function of the interplane "struts" appears to be that of ties which partially distribute the load from plane to plane. Their section is such that they can hardly be expected to withstand reverse loading, and it is thought that this fact may be one explanation of the bad name which the Fokker has earned by breakage in the air.

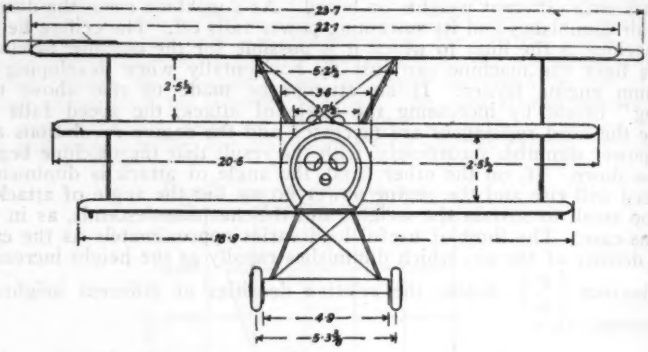


FIG. 1.

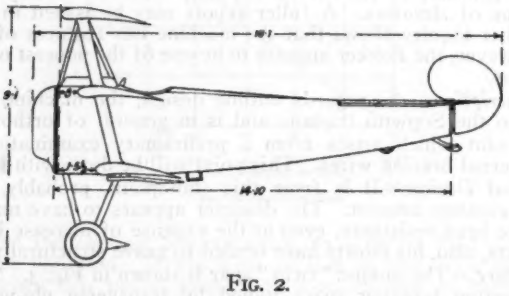


FIG. 2.

Tail Unit Structure.—Here again we find that reduction of resistance has been attained by deletion of external bracing. In this case, however, the tail unit being largely of tubular construction the cantilever structure, besides being heavy, is very weak. The proportions of the framework are approximately such as obtain on most normally-braced frame works, and once more an explanation suggests itself for the structural failures experienced on this type.

Body Structure.—The framework of the body is built up from steel tubing butt-welded at the joints. The standard wiring attachments consist of a short length of small tubing bent to the form of a quadrant or semi-circle (as required), and welded into the corners of cellules (see Fig. 5). The bracing wires are looped round these attachments, doubling back upon themselves, thus functioning as a single wire of double length. Splices are dispensed with, but beyond that nothing good can be seen in

this method of wiring, which is heavy and very weak, as its "fixing strength" is that of wire doubled round a small diameter pin in place of twice that strength as is obtained by splicing.

The use of welding in the building up of the body also appears to be a weak feature. Vibration and reversal of stress cannot be taken adequately by such a structure. The corner attachments are somewhat reminiscent of the well-known Short U-bolt. The U-bolt had the standardization advantages of the Fokker fitting, and, in addition, without further sacrifice in weight, was a far more reliable and robust wiring attachment.

Summary of Constructional Criticism.—On broad lines little good can be said of the Fokker structure. The designer appears to have employed considerable ingenuity (or exhibited considerable mental slackness) in devising schemes whereby slight increase of manufacturing speed has been purchased at the price of grave structural weakness or increased weight. Where speed of production has not tempted him, his aim has been reduction of resistance. Here also, strength—and above all, permanence of struc-

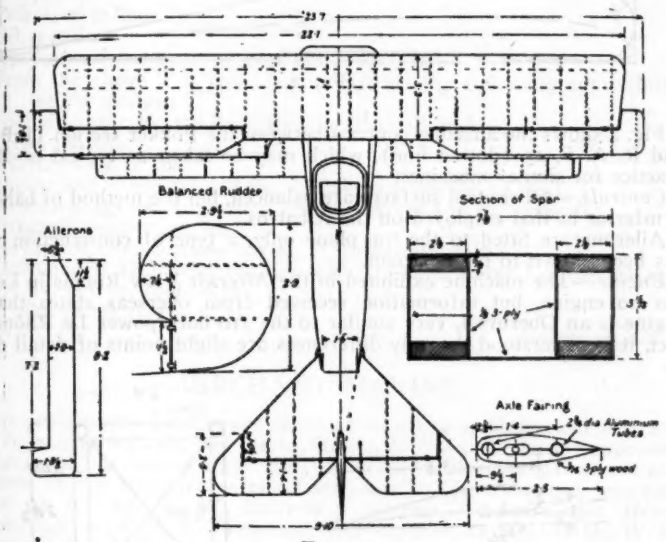


FIG. 3.

tural rigidity—has been disregarded, and yet it is hard to see what notable gain of "fineness" has been attained.

Wing Tip Skids.—These are rigidly-fixed ash skids located under the wing struts. The reason for fitting them is obscure, as they can only come into play as a result of an appallingly poor landing, and if they did come into play, would certainly buckle the flimsy interplane struts.

Aerodynamical Features.—Certain of these features have been mentioned already. In this respect also, the design shows evidence that it has been carried out hastily and in a slovenly manner. There are signs of considerable ingenuity, but they are often marred by lack of broad consideration.

Wing Design.—Here, for instance, we have the elimination of external wiring. The "wireless" machine is not a new idea; many constructors have realized its good points—namely, the saving of wire resistance, and the diminution of tuning-up troubles. The Fokker designer has missed the counterbalancing defects, and his method of attack has led him into two grave faults. In the first place, the cantilever construction adopted is not

only weak, but essentially non-rigid. The deformation under maneuvering stresses and the consequent variations of aerodynamical load-distribution would appear to render the problem of controllability curiously complicated.

Further, the high cambered section of the aerofoils cannot but counteract the slight advantage due to the saving of wire resistance. Experience has shown that "low lift" aerofoils cannot be beaten for use on scouts, and that whatever advantage in climb and altitude-flying capacity may be attained by the use of "high-lift" sections is canceled and far more than canceled by the excessive horsepower required at fine angles of attack. When one considers the triplane effect (especially on small gap) which must, from first principles, obtain with such a deeply cambered section the inefficiency of the main planes becomes evident.

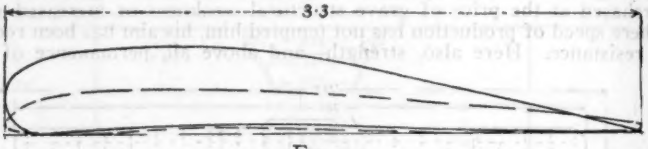


FIG. 4.

Fig. 4 shows the amazing contrast between the Fokker section (full line) and R. A. F. 15 (dotted line), which may be taken as typical of British practice for similar machines.

Controls.—All control surfaces are balanced, but the method of balancing is inferior to that employed on the Albatros.

Ailerons are fitted to the top plane only, a type of construction which has been shown to be inefficient.

Engine.—The machine exhibited in the Aircraft View Rooms in London has no engine, but information received from overseas states that the engine is an Oberursel, very similar to the 110 horsepower Le Rhône. In fact, it is understood the only differences are slight points of detail design

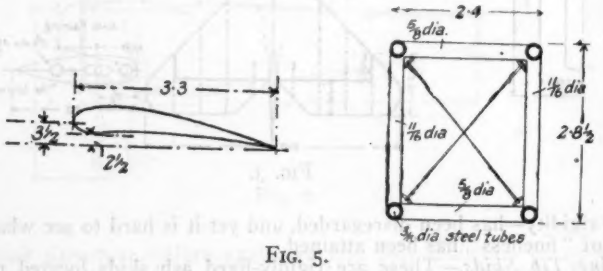


FIG. 5.

and the relative poverty of general finish. For instance, the nose piece is in two portions, the propeller shaft being separate from and bolted to the front plate of the engine.

The carbureter is a French-made Tampier bloctube, presumably obtained from a captured machine.

The oil pump appears to be a German copy of the standard Le Rhône oil pump. The magneto is a Bosch.

Armament.—Two Spandau guns are fitted, firing forward through the propeller, and fitted with synchronizing gear of the direct flexible drive type, a pinion on the flex shafting engaging with the gear wheel which meshes with the magneto and oil pump drives.

The guns are controlled by Bowden wires, from thumbpushes on the control lever. Three pushes are fitted, two for firing the guns independently and the third for simultaneous control.

Identification Marks.

R. F. C. No. G.125.
Maker No. 1856.
Military No. FOK. D. R. I. 144/17.
Date of construction, Nov. 20, 1917.

Weights (as Stenciled on Machine).

Weight, empty .....376 kg. = 829 lbs.
Permissible load (including fuel) .....195 kg. = 430 lbs.
Total weight .....571 kg. = 1259 lbs.

Weight of Engine.

334 lbs., including hub, magneto, oil pump and carbureter.
(NOTE.—Weight of 110-horsepower Le Rhône is 330 lbs.).

Tank Capacity.

Petrol, 16 gallons } approximate.
Oil, 4 gallons }
(Approximate duration—2½ hours at 10,000 ft.)

From the above it is possible to construct the following approximate weight analysis:

Fuel, oil and tank, 170 lbs. (allowing tank 18 lbs.).
Crew, 180 lbs.
Military load, 98 lbs.
Engine and propeller, 358 lbs. (allowing propeller 24 lbs.).
Structure, 453 lbs. (including engine bearers and instruments).
Structure percentage, 36.
Surface of main planes—205 sq. ft. (approximately).
Estimated B. H. P. (by analogy with 110-horsepower Le Rhône)—113
lbs. per sq. foot—6.14.
lbs. per B. H. P.—11.15.

—*Aviation*, 1/6.

MERCHANT MARINE

EFFECT OF TORPEDO EXPLOSIONS ON THE STRUCTURE OF MERCHANT SHIPS.—Some time ago the Council of the Institution of Naval Architects appointed a committee "to inquire into the effects of explosions of mines and torpedoes on the structure of merchant ships." The committee was constituted as follows: S. W. Barnaby (chairman), Admiral Sir Henry Jackson, G. C. B., F. R. S.; Professor Sir John Biles, D. Sc., LL. D.; W. H. Whiting, C. B.; A. E. Seaton, Professor T. B. Abell, M. Eng.; Professor J. J. Welch, M. Sc.; R. W. Dana, M. A., secretary.

Their first report is on cargo steamers, and the second on passenger steamers, and they were submitted in May, 1917. They were made available privately to shipbuilders and shipowners; but official sanction was given to their publication along with the annual report of the council to this year's meeting of the institution. The report is as follows:

I. Cargo Ships.—Your committee have thought it desirable to issue a preliminary report containing suggestions for certain temporary war expedients which might be adopted at very little expense in the ordinary type of cargo vessel, and which they are of opinion would have the effect of greatly increasing their chances of safety after being mined or torpedoed, provided that only one main compartment is opened up to the sea.

The committee, having examined the information placed at their disposal by the Admiralty and the Board of Trade, are of opinion that the loss of many of these vessels has been due to three causes: (a) the existence of watertight doors low down in the bulkheads, which could not be closed after the explosion; (b) fractures of suction pipes in the

attacked compartment, permitting water to flow into adjacent compartments; (c) the penetration of bulkheads adjacent to the attacked compartments by fragments of plating, frames, rivets, etc.

A large number of cargo vessels have four main holds and six bulkheads arranged as follows: No. 1, collision bulkhead; No. 2, between Nos. 1 and 2 holds; No. 3 at fore end of boiler room; No. 4, at aft end of engine room; No. 5, between Nos. 3 and 4 holds; No. 6, at after peak.

With fewer bulkheads than this the chances of keeping a vessel afloat are very much reduced.

Taking this six bulkhead arrangement as a typical case, the recommendations of the committee, as applied to cargo ships with six or more bulkheads, are as follows:

1. All existing watertight doors low down in main bulkheads should be closed up and so secured that they cannot be opened. If watertight doors are necessary, they should be fitted high up in the bulkhead.

This is particularly important when bunker coal is carried forward of the boiler room bulkhead, as a watertight door through which coal is being trimmed cannot be depended upon.

2. The watertight door to the shaft tunnel in the engine room bulkhead should be closed up and so secured that it cannot be opened, access to the tunnel being provided by means of a watertight trunk carried up to the bulkhead deck.

Cases have occurred when the engine room has been flooded too quickly to permit of the tunnel door being closed, with the result that considerable quantities of water have entered the after holds through the tunnel, which was not sufficiently watertight.

An explosion in one of the after holds would be likely to injure the tunnel, resulting in the flooding of the engine room and boiler room, unless the tunnel door is closed, as proposed.

3. The tunnel, or any other longitudinal passage below the waterline, should be thoroughly watertight.

4. Each suction pipe, where it enters the compartment from which it drains, should be provided with a screw-down non-return or other suitable valve, which can be worked from the bulkhead deck. These valves should be kept closed at all times, except when the pumps are in use.

5. The amount of injury which the bulkheads might receive from flying fragments will depend greatly on the nature and amount of cargo in the hold.

If the hold is well filled, the risk of injury is much less than when partly filled or empty. If the cargo is of a heavy nature the upper parts of the bulkheads will probably be exposed.

It is recommended that, wherever possible, the bulkheads should be protected temporarily by means of timber or other suitable material, forming a splinter screen. In some cases the cargo itself could be utilized for this purpose. The necessity for some protection of this sort is particularly great in the case of ships in ballast.

Very little time and money would be expended in giving these measures of protection to a large number of cargo vessels.

II. Existing Large Mail and Passenger Vessels.—These vessels, having more numerous bulkheads in proportion to their length than the ordinary cargo steamer already reported on, should be better able to withstand attack from mine or torpedo.

On the other hand, many mail and passenger steamers have watertight doors in the 'tween decks, giving communication through the watertight bulkheads between passenger and other spaces. They have also side scuttles for ventilating cabins, and numerous sanitary discharges very near the water-line. These are liable to be submerged and to admit water should the scuttles be open or the controlling valves to the baths, water closets, etc., be inefficient. This liability will be greater in the case of vessels having small initial stability or possessing longitudinal bulkheads, if damage occurs in way of such bulkheads. In some vessels also there are

passages leading through bulkheads in the ship's hold to allow the firemen and greasers to gain their quarters without traversing any of the passenger decks. All these features have proved to be sources of danger.

Further, the hatchways in such vessels are relatively small and do not afford such instantaneous relief from air and gas pressure resulting from an explosion as in the case of the larger hatchways of cargo vessels. For this reason it is considered that bulkheads in the neighborhood of the explosion are more liable to distortion in mail and passenger vessels than in cargo ships, and that watertight doors on such bulkheads cannot be relied upon to close after an explosion. Devices for closing doors from the bridge are likely to fail, both by reason of the above-mentioned distortion and because of the probable destruction of the hydraulic or electric mains provided for the purpose in the region of the explosion.

In view of the foregoing, it is suggested that the following measures be adopted in existing vessels during the continuance of the war:

1. The disuse of all firemen's passages and the closing up of all doorways in bulkheads traversed by them when below the bulkhead deck, the firemen passing to and from their quarters by way of an upper deck, where a temporary screened passage could be provided if necessary.

2. All openings from the engine room into shaft tunnels to be abolished and access to tunnels provided through trunks abaft the engine room bulkhead: these trunks to be watertight to the bulkhead deck.

3. All watertight doors in transverse bulkheads throughout the machinery spaces to be closed and so secured that they cannot be opened, provision being made for efficient supervision in each separate compartment. If this is deemed impracticable in certain cases it is recommended that in such cases the doors on the level of the stokehold and engine room floors should be closed and others fitted as high up as possible on these bulkheads.

4. All watertight doors in transverse bulkheads on decks below the bulkhead deck to be closed and so secured that they cannot be opened, additional exits to the decks above being provided where necessary.

5. All side scuttles situated below the first deck above the bulkhead deck should be closed up and sealed. Special fan ventilation is to be provided if necessary for the cabins affected.

6. Each suction pipe, where it enters the compartment from which it drains, should be provided with a screw-down non-return or other suitable valve which can be worked from the bulkhead deck. These valves are to be kept closed except when the pumps are in use.

7. Where ventilation trunks, etc., pass through watertight bulkheads below the bulkhead deck, valves operated from above that deck should, in all cases, be fitted at the bulkheads, and if any trunk pierces the bulkhead at a low level it is strongly recommended that a new lead should be devised to carry it through the bulkhead at as high a level as possible.

8. Valves on all sanitary discharges at the ship's side should be such as will prevent water passing inboard through them when the vessel has considerable trim or list. These valves should be frequently examined and kept in good order.

9. Any ash or rubbish shoots, etc., having upper ends opening on decks below the bulkhead deck should be provided with watertight covers, and instructions should be issued to ensure that these covers are always in place when the shoots are not in use.—*Marine Engineering*, May, 1918.

TONNAGE DEFINITIONS.—The tonnage of a ship is the weight or carrying capacity expressed in tons.

In nautical parlance, four kinds of tonnage are usually spoken of. These are displacement tonnage, deadweight tonnage, gross tonnage, and net tonnage.

Displacement tonnage represents the amount of water displaced by a vessel. If she is floating in equilibrium in still water, the weight of water she displaces equals the weight of the vessel herself with everything on board. The displacement in cubic feet when floating in salt water divided

by 35, and when floating in fresh water divided by 36, gives the total weight of a ship and her cargo in tons; for 35 cubic feet of salt water weighs 1 ton (2240 pounds), and 36 cubic feet of fresh water the same amount. As a rule, the displacement tonnage is equal to the deadweight tonnage multiplied by 1.64.

Deadweight tonnage represents the carrying capacity of a ship and includes the tons of cargo and generally the coal. The deadweight tonnage equals about 64 per cent of the displacement tonnage and can be obtained by subtracting from the displacement tonnage the weight of the vessel when empty.

Gross tonnage is obtained by ascertaining the total internal capacity of the ship in cubic feet below the upper deck, and of all enclosed spaces or deckhouses above the deck and dividing the result by 100.

Net tonnage is obtained from the gross tonnage by subtracting from the measure (before dividing it by 100) the cubic contents of all spaces not devoted to the carrying of passengers or cargo, such as those containing the propelling machinery, boilers, officers' quarters, crew's quarters, etc. Though 100 cubic feet of space are allotted to the ton in computing tonnage, in ascertaining freight charges based upon the bulk of the cargo, 40 cubic feet only are allowed. This is the space occupied by a ton of good close stowed steaming coal, and is not far from that required for a ton of average cargo. Roughly speaking, the tons of cargo that can be carried by a freight steamer can be obtained by multiplying the net tonnage by 2.5.—*Nautical Gazette*, 25/4.

DOUBLE COMPARTMENTS FOR ALL U. S. SHIPS.—The Shipping Board has authorized the equipment of all American vessels with an anti-submarine compartment construction, devised by the ship protection committee. By doubling the number of compartments in both wooden and steel ships from four to eight, the chances of sinking from a single torpedo attack will be reduced 50 per cent, it is stated.

The new compartment construction, which has the approval of Admiral David W. Taylor, chief constructor of the Navy Department, will be installed by the James C. Stewart Company, of New York. Equipment of the entire 322 American vessels now in transatlantic service will be completed at a loss of only 5000 tons of cargo space.

The Shipping Board plans to equip barges with machinery for the rapid installation of the new compartment construction. Work will proceed day and night while the ships are in port loading and bunkering.

While it is admitted that cutting the existing compartments of vessels in two will slow down to some extent their loading, it is stated the advantages to be gained in minimizing the dangers from submarine attack will more than compensate for this disadvantage.—*Nautical Gazette*, 18/4.

BRITISH FABRICATED SHIPS.—Further information is available regarding what is termed "fabricated ships" for the British merchant service. This name is applied to vessels, the component parts of which are put together and, as far as possible, riveted in bridge building and other inland steel constructional works, the units being as large as is admissible for transit by rail or road to ship-assembling yards, for putting together for launch and completion. The idea of the fabricated ships is somewhat erroneously considered to be novel, but it is really only a development of a procedure which has been adopted in ordinary shipbuilding yards for a considerable time, and has, in the last year or two, been greatly extended, sections of decks, as well as framing, etc., being completed on staging close to the ship, where the work of riveting is done more quickly, becaus there is greater accessibility for the pneumatic and other riveting machines. No doubt, in our present emergency, advantage accrues from utilizing plant at the bridge-building establishments, but the congestion of the railways necessitates the shortest possible length of transit from the steel-constructional works to the ship-assembling yards. This is a question which, we fear, is not receiv-

ing the fullest consideration owing in part to the preconceived idea that fabricated ships should be built in specially-devised ship-assembling yards, and particularly in the National Shipbuilding Yards now being organized on the Bristol Channel. If the component units of ships are prepared in Glasgow, obviously it would be better to utilize them in the Clyde shipbuilding district; this applies similarly to the northeast coast. The South Wales steel district, therefore, should be the only source of supply for the National Yards on the Bristol Channel. Only on this hypothesis is the establishment of national yards on the Bristol Channel, at the present juncture, justifiable. This is particularly the case, as there has been no satisfactory reply, with full evidence, to meet the contention that all the berths in existing yards are not continually occupied, and that all the skilled labor drawn from the army at home which could be absorbed efficiently in private yards has not been supplied to these establishments, already effectively organized and satisfactorily equipped from a mechanical standpoint. The information available regarding the fabricated ship is to the effect that it is a bigger ship than most of the standard ships, and that there is not a curved frame in it. The size and weight of the unit of construction are limited, so that transport is easy, and powerful gear for placing it in position unnecessary. As regards machinery, geared turbines have been adopted in place of reciprocating engines, as these can be built extensively in other than marine engineering shops.—*Nautical Gazette*, 18/5.

The *unsinkable ship* idea as developed in the steamer *Lucia* is impracticable, according to an official report by the Naval Board which recently inspected the ship before her transatlantic voyage. The report is now before Secretary of the Navy Daniels and he intends to make an official announcement concerning it soon. In the main, however, it is known to say that the device of putting air tight boxes in the ship hull requires too much space and too much time to make it practical for use in American ships. On the other hand, the Board recommended that the best available method of making ships more unsinkable than at present is to include extra bulkheads.—*Shipping*, 25/5.

CONCRETE SHIP "FAITH" SUPERIOR TO STEEL.—An official report to-day on the behavior of the concrete ship *Faith* during her second trial trip off the Pacific Coast in a strong wind and choppy sea, says the vessel is believed to be fully equal, if not superior to any steel ship of the same size and equal power. The *Faith* will soon undertake her maiden voyage with cargo.

The *Faith* made 10.2 knots. Despite much pitching the absence of vibration was declared to be "very noticeable." Scientific instruments, observed by experts of the Shipping Board, showed that the vessel withstood a maximum range longitudinal stress amidships of 1200 pounds per square inch in steel deck and bottom.—*Balto. American*, 18/5.

THE CONCRETE SHIP.—Reports of concrete ship experiments are so favorable that little doubt is now felt that this type of craft will soon be produced in quantity. Recently the steamer *Faith*, built of concrete, after a successful trial run in San Francisco harbor, in the course of which she made an average speed of 10.3 knots an hour, made a voyage in cargo to Vancouver from which reports have been received indicating a most satisfactory performance. In the course of the trip to Vancouver she encountered an 80-mile gale and 35-foot waves. During this storm she made a speed of between four and five knots, considered an excellent performance in the circumstances. No vibration was felt. A more severe test could not have been obtained than a run through such a storm, and the *Faith* is regarded as a successful demonstration of the possibility of ship construction on a large scale from concrete. It is understood that the craft on her return from Vancouver will be sent through the Panama Canal to ply in the sugar trade between Cuba and Atlantic ports, thus bringing the demonstration of concrete ship construction directly under observation. Indeed,

it is believed that this type of vessel has passed the experimental stage. Some contracts have already been let for additions to the concrete fleet, and others are in contemplation. If this type of ship is merely the equal of the steel ship the advantage of speed of construction and the greater universality of materials would render it a favorable form, at least for emergency building. But the advocates of concrete boats claim, and the *Faith's* performance seems to justify the claim, that the lack of vibration is a distinct advantage, which may result in a general adoption of this type, at least for the slower cargo trade.—*Wash. Evening Star*, 3/6.

J. Foster King, the British Corporation Chief Surveyor, has compiled the following list of properties of good shipbuilding concrete from the latest information available to him: (a) Good concrete was almost uniformly elastic up to the point of fracture. (b) It should be watertight up to the point of fracture. (c) It usually had a compressive strength about ten times as great as its tensile strength. (d) It might be safely estimated to have a tensile strength of at least 300 lbs. per square inch. (e) Its tensile strength was a fair measure of its shear strength. (f) Good concrete reinforced by steel rods properly arranged, and having a small area in proportion to the area of the concrete, would bind the steel under a pressure which might be over 200 lbs. per square inch of steel surface. (g) Under the above conditions the binding effect of concrete upon a length of rod corresponding to 30-40 diameters was equal to the tensile strength of the rod. (h) Although the tensile strength of concrete was only 1 per cent, the elastic modulus of concrete was 8 per cent of that steel. (j) Reinforcement did not alter the relationship between the above moduli. (k) Reinforcement did not alter the stress at which fractures occurred in the concrete, although it might not alter the stress at which fracture would occur outside the influence of its own bond upon the steel. Evidence of molecular disturbance might occur at the breaking stress of the concrete, but actual fracture was delayed until the stress was about 45 per cent greater. (l) The elastic modulus of reinforced concrete was the same as that of plain concrete—8 per cent of that of steel. (m) The strain upon the reinforcement could not therefore exceed that due to a stress of 5400 lbs., or, say, 2½ tons, per square inch if the concrete was to remain unbroken.—*Shipping*, 25/5.

LAUNCHING OF THE "AGAWAM."—*Construction Details of Fleet Corporation's First Fabricated Ship.*—In the presence of 10,000 spectators, the first of the standardized steel cargo vessels ordered by the Emergency Fleet Corporation was successfully launched on Decoration Day, in the yards of the Submarine Boat Corporation, on Newark Bay. The name *Agawam* was selected for the new ship by Mrs. Woodrow Wilson. It is an Indian name, meaning "Great Salt Meadows of the Atlantic Coast," and is appropriate because it was in these meadows that the ship was born.

The *Agawam* is the first vessel to be launched by the use of a device that releases the hull by the pulling of a trigger. This is said to be the invention of Clark Henderson, the chief engineer of the Submarine Boat Corporation. It worked efficiently. When the word was given, instead of sawing through a timber, a workman cut two ropes with a knife, and another pulled back the lever of the machine. In a moment the vessel began to glide toward Newark Bay. At that moment Miss Mary Eurana Ward, a niece of Mr. Schwab, broke a bottle of champagne on the side of the *Agawam*, and named the vessel, as a great shout went up from yard and stand.

In the exercises following the launching President Carse, of the Submarine Boat Corporation, said in an address that "the launching of the *Agawam* celebrates a new era in the construction of steel ships." Continuing his remarks, Mr. Carse said in part:

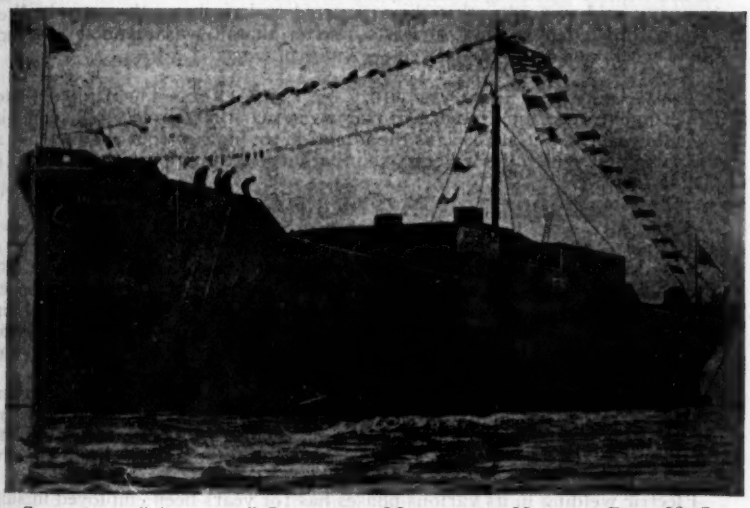
"The *Agawam* is the first of 150 vessels, all of the same standardized type, from designs of Theodore E. Ferris, to be built of commercial steel plates and shapes along lines evolved by bridge builders, in conjunction with

naval architects, and thus enabling us to call upon the structural metal workers of the country.

"The parts are fabricated in bridge and tank shops throughout the country east of the Mississippi River, and assembled at this plant.

"*Parts Fit Perfectly.*—Ninety-five per cent of the work in forming the parts entering into the hull of this vessel and punching rivet holes is done at shops widely separated, from drawings furnished by this company, and these drawings have been of such exactitude and the work has been so carefully performed by the different bridge shops that when they are brought together at this yard they fit perfectly and the ship, as you see, is absolutely fair.

"The construction of the hull of this vessel requires the driving of over four hundred thousand rivets, and by our method more than one-quarter of these rivets are driven at the distant shops, the different parts being brought to the yard in sections as large as can be transported on the railroads. Each part is numbered and lettered, and as they are shaped perfectly, all that is necessary is to place them in position, bolt them, and finally fasten them with rivets.



STEAMSHIP "AGAWAM," LAUNCHED MAY 30, AT NEWARK BAY, N. J., SHIPYARD.

"Standardized fabrication to this extent has never before been attempted in the shipbuilding industry, and this development has been brought about only by the urgent need for ships and the necessity for securing them by some new method, for old methods could not replace the loss of shipping caused by the ravages of the German submarines. Some 27 steel mills, 56 fabricating plants, and 200 foundries, machine shops, etc., contributed to the construction of the vessel."

The *Agawam* will have a displacement of approximately 7800 tons when loaded to the Plimsoll mark, and a deadweight carrying capacity of about 5500 tons. The length of the vessel is 343 feet on deck, the moulded breadth being 46 feet, and the moulded depth of hull 28 feet 6 inches. The maintained speed of the vessel at sea fully loaded will be at least 10½ knots on a mean draft of approximately 23 feet.

The main machinery consists of a Westinghouse steam turbine, operating at 3600 revolutions per minute, during the single-screw propeller at ninety

revolutions per minute through a Westinghouse balanced floated type reduction gear. Steam supply to the turbine will be furnished by two Babcock and Wilcox marine-type water-tube boilers, which have been installed in the ship before launching.

The auxiliary machinery of the vessel will be most complete, including duplicate electric-light plants, refrigerating plant, pumping machinery for numerous systems, forced-draft blower, evaporator, heaters, cargo-handling machinery, windlass, capstan, steering engine, auxiliary condenser, etc. Fuel oil will be used, this fuel being carried in compartments of the double bottom of the ship in sufficient quantity to more than cover the round trip to Europe.

Along the water front of the Submarine Boat Company's yard are 28 ways upon which are already rising sister ships of the *Agawam*. Each vessel will be ready for sea service in the yards.

The keel of the *Agawam* was laid on December 20, but construction was delayed by the tardy arrival of materials and adverse weather conditions of the winter. Little was accomplished in the first month. Officials of the company said yesterday that they expected to launch another standardized ship within ten days or two weeks. After that it was planned to launch one a week, and later two a week.—*Nautical Gazette*, 8/6.

GOVERNMENT TO TAKE OVER THE CAPE COD CANAL.—The United States Government, according to current rumors in maritime circles, will soon take over the Cape Cod Canal. It is the intention to dig a 40-foot channel, and at the same time widen the waterway so that large steamers can make use of it. —*Nautical Gazette*, 8/6.

MISCELLANEOUS NOTES

TESTING THE RELATIVE STRENGTHS OF RIVETED AND WELDED PARTS OF A SHIP'S HULL.—The purposes and possible benefits of the ship-welding test being conducted by the Emergency Fleet Corporation at the Central Shipbuilding plant, at Newark, N. J., under the direction of Arthur J. Mason, are outlined in a report made to Charles Piez, vice-president of the corporation, by Mr. Mason. The report follows:

The committee of which Prof. C. A. Adams is chairman has been enlarged, as instructed, and is active in bringing to bear all the knowledge and apparatus available, about which, no doubt, reports will come to you directly from time to time. I am a member of that committee and continue in active touch with it and rely on it for technical knowledge.

Electric welding in its various phases has for years been employed in shipyards and in the arts generally, but for a number of reasons the work has been confined to odd jobs and repairs. The proposal to extend its use to the major part of ship construction has met with gratifying approval from the shipbuilder. It remains for us through this large test to demonstrate its economy in time and money and its adequacy to build a stanch ship.

The purpose of this test is to demonstrate these advantages, to do it in such a way that all may see and contribute, and finally to test the structure itself so completely that there will follow a heart-whole and unanimous belief in the method.

The test itself will take the form of building part of a hull at the Federal Shipbuilding plant, Newark, N. J.

It has been necessary to design a ship to suit the material available, without encroaching on that needed for the regular ship construction at the plant. This has been done. The hull will have the outline, dimensions and strength conforming to the ships the Federal company is building.

It has been thought best to conduct the work at a site apart from the shipways, so as not to interfere with that program.

A 10,000-ton ship, costing $2,000,000, now costs but $70,000 to rivet. It must be plain that if electric welding only promises to modify this amount, no very substantial gain offers.

Splendid benefits we all feel do offer themselves in the possible change in the whole régime of shipbuilding. Our test has in view abolishing, or greatly diminishing—

1. The railroad journey from rolling mill to fabricating plant, when the latter is not at the shipyard.
2. The template-makers' work.
3. The markers' work.
4. The punching.
5. Much of the work of the fitters and bolters, who flog and pull the pieces to fit on the ways.

There lies in the above items an excellent likelihood to save a month's time in construction and a saving of no less than $40 a ton in the cost of steel structure, at least $100,000 a hull on a 10,000-ton vessel.

Briefly, the program is to assemble a hull rapidly by spot welding, tacking the ship together much as a tailor bastes his work in assembling a suit of clothes. The structure then becomes a house favorable for work in all weather and at night in which the completion of the ship may go on.

After the material is thus assembled and fastened with spot welds so that it is sufficiently strong to hold its shape, the work is completed by arc-welding all seams to insure strength and render the work watertight. Roughly we expect the spot welds to be about 10 inches apart.

The severe tests of strength contemplated needed about 300 piles.

One quarter of the structure will be riveted; the other three-fourths welded so that the tests of strength will afford a basis of comparison.

Electric welding offers a great field for lightening a ship. In this design various views of this opportunity will be tried out. The field here is very great—ultimately 10 per cent of the steel may be eliminated.

Only a fifth of the men on a hull are riveters. The spotweld yoke will forthwith pull the parts to place with more vigorous agency than flogging and pulling to place by numerous bolts, now done by the other four-fifths.

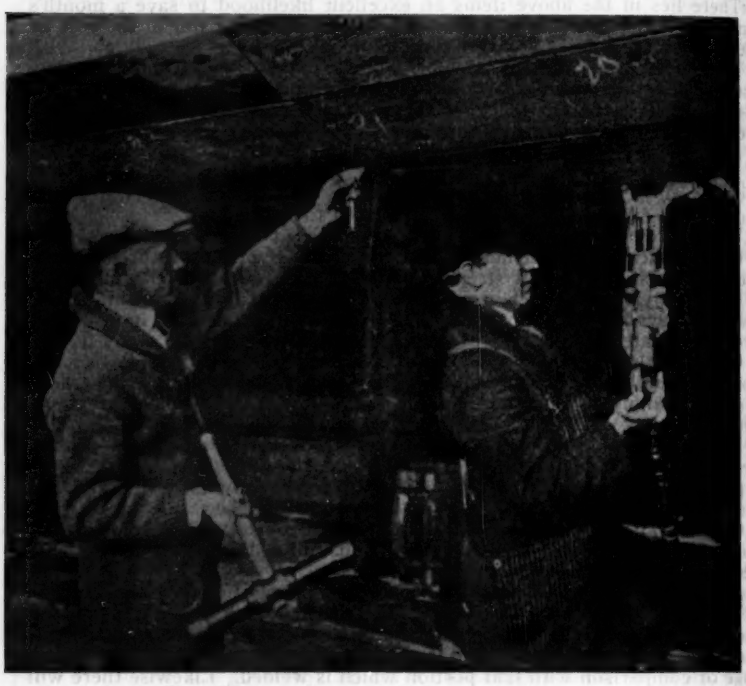
The problems of fitting in place the parts of a hull are almost wholly problems arising out of the necessity to make a number of little holes in a plate made by one man at one time and place fit a number of little holes made by another man at another time and another place.

Once all holes are left out of the material, all parts fit. The creeping and kindred problems so perplexing to the shipbuilder disappear. Every plate becomes a closer. Every plate justifies itself.

An adequate system of testing the work when done is under consideration. The primary test will consist of filling the hull with water and shifting the points of support under continual and close scrutiny, as one-quarter of the whole will be riveted in the normal manner. There will be always a gage of comparison with that portion which is welded. Likewise there will be a chance for comparison of the two forms when subjected to abuse, by bumping with rams and in various other ways.—*Emergency Fleet News*, 29/4.

A NEW TOOL THAT FILLS A LONG FELT WANT.—Shipbuilders will be interested to learn of the perfection of a practical pneumatic calking machine. This tool, known as the "Little David" Calking Machine, is being placed on the market by the Ingersoll-Rand Company, 11 Broadway, New York, who report an enthusiastic reception where it has been introduced. This device weighs but 13½ pounds and observed performances show that it can be easily handled and operated in any position. It automatically tacks either machine or hand spun oakum in side or bottom seams to any depth required for final horsing. On deck planking it will do the horsing. Its working speed is about 1500 tacks per minute either coiling or running the oakum straight. It is controlled by a trigger similar to a light scaling hammer, different, however, from the usual hammer in that the piston has an extended rod fitted with a thin calking blade. This being a reciprocating iron with positive pull back, has no tendency to bind. The calking iron

travels in guides which prevent it from turning, the whole being fitted with springs so that the workman can vary the penetration of the calking iron with the varying depth of the seam. A unique device automatically feeds the oakum with each movement of the calking blade. Guide wheels run in the seam being calked and keep the threading iron lined up. The tool operates with negligible vibration and its design is such that it follows without effort on the part of the workman; in fact, machine calking is so simple that ordinary workmen can do highly efficient work. A demonstration was recently conducted before the U. S. Shipping Board, Emergency Fleet Corporation, and the tool was approved by them.



THE "LITTLE DAVID" CALKING MACHINE.

The "Little David" measures 22 inches in overall length. The ordinary equipment consists of a calking iron of 1/16-inch thickness although a ⅛-inch iron can be furnished if desired. This tool should immeasurably increase the speed of wooden shipbuilding, which up to now has been hindered by an inadequate supply of calkers.—*Marine Journal.*

CURRENT NAVAL AND PROFESSIONAL PAPERS

UNITED STATES

ATLANTIC MONTHLY. **June.**—The Western Front and Political Strategy, by *André Chéradame.*

AVIATION. **June.**—The Friedrichshafen Bombing Biplane (full description). The S. E. 5A Pursuit Biplane.

MARINE ENGINEERING. **June.**—Engineering Education as Applied to Marine Engineering and Naval Architecture, by *H. A. Everett.* Salvage of German Tanker *Gut Heil,* by *Robert G. Skerrett.*

FLYING. **June.**—Flying Boat and Hydro-aeroplane for Sea Flying, by *Lieutenant G. Adamoli,* Italian Flying Corps.

REVIEW OF REVIEWS. **June.**—To Safeguard the Seas (by an International Marine Union), with comment by well-known publicists, by *Harrington Emerson.* West Coast Shipbuilding, by *C. V. Dyment.*

WORLD'S WORK. **June.**—Our New Supply of Nitrates, by *F. P. Stockbridge.*

NATIONAL GEOGRAPHIC MAGAZINE. **April.**—The American Navy, by *Hon. Josephus Daniels.*

INDEPENDENT. **June 8.**—Sim's Circus: A Cruise with Our Destroyers, by *Herman Whitaker.*

YALE REVIEW. **July.**—The War and Peace Aims of British Labor, by *Arthur Henderson, M. P.* Should the United States Build the Channel Tunnel? (a proposal to supply this aid to the Allies as an immediate military necessity), by *Major General Greene.* Illusions of the Kaiser and the Allies, by *E. J. Dillon.* The Soldier's Social Problem Abroad, by *Prof. W. E. Hocking.* Why Holland Has Kept Neutral, by *Hendrik W. Van Loon.*

MARINE ENGINEER AND NAVAL ARCHITECT. **May.**—Boiler and Other Repairs by Electric Welding. The Ferro-Concrete Ship, by *T. J. Gueritte.*

AMERICAN MACHINIST. **May 23.**—Manufacture of Lewis Machine Gun, by *Frank A. Stanley.* Relining Guns at Watervliet Arsenal, by *E. A. Suverkop.* **June 13.**—War-Time Repairs in the Navy (continued), by *F. A. Stanley.*

GREAT BRITAIN

ENGINEER. **May 17.**—The Turbo-Electric Ship *Wulsty Castle.* **May 24.**—Some Notes on Importance of Research in Marine Engineering, by *A. E. Seaton.* Large Three-Crank Double-Acting Gas Engine.

CASSIER'S ENGINEERING MONTHLY. **May.**—Reinforced Concrete Ships, by *T. G. Owen Thurston.*

ENGINEERING. **May 3.**—Stability of Aeroplanes. **May 10.**—Ship Losses and Replacement.

SHIPPING. **June 1.**—Standard Cargo Ship Building, by *Sir George Carter.*

NAUTICAL GAZETTE. **June 8.**—Recent Progress in Electric Welding, by *T. G. McKay.*

CONTINENTAL EUROPE

REVUE DES DEUX MONDES. **May 15.**—Zeebrugge and Ostend: Our First Operation on the Northern Front, by *Rear Admiral Degouy.*

INTERNATIONAL NOTES

1. Naval War Notes.....1645
2. Diplomatic Notes.....1714

NAVAL WAR NOTES

PREPARED BY

Lieutenant W. B. Jupp, U. S. Navy

Strategy.....1645
Lessons of the War.....1657
Naval Operations:
Atlantic.....1658
North Sea and Channel.....1676
Baltic and Skagerrack.....1687
Mediterranean.....1688
Black Sea and Bosphorus.....1691
Pacific and Indian Oceans.....1692
General Notes:
Submarines.....1693
Military.....1699
Index of War Vessel Losses During the War.....1704
Index of War Vessel Losses, This Number.....1713

STRATEGY

Sea Power's Influence To-Day.—There are two inferences as to Germany's purpose in making her submarine raid on our merchant shipping off the Atlantic coast that at once suggest themselves to any observer of Germany's naval campaigns since she has been forced to use the undersea boat as her only naval weapon. The one is that the campaign against Allied shipping and transports has failed in the war zone of Europe; and the second, that the German general staff has attempted, once again, to frighten the people of an Anglo-Saxon race through what all nations other than those under Teutonic influences regard as acts of piracy. Behind this lies the broader principle that Germany is trying to make the land control the sea, a military theory proved untenable since man first began to go to sea with the intention of fighting on it. And in spite of what inroads she has made on the merchant ships of the world and what she may do sporadically in the future it remains that Germany has been beaten on the sea since August, 1914, since the day when she ordered every one of her own merchant ships to intern wherever they were, whether in neutral or enemy harbors. The battle off the Falkland Islands settled the fate of Germany's one squadron at sea. Jutland gave the quietus to any ideas held by the German Navy that it would find the British Navy napping or unwilling to engage in battle. Her submarine weapon is being beaten by the navies of Britain, France, Italy, Japan and the United States just as her fleet is contained by them and her commerce is swept off the seas. The Emperor William resembles Napoleon in only two respects. He does not really understand sea power; and he evidently believes that he can defy it. External and internal conditions as to the economic state of the Central Powers show plainly that his faith is founded on sand.

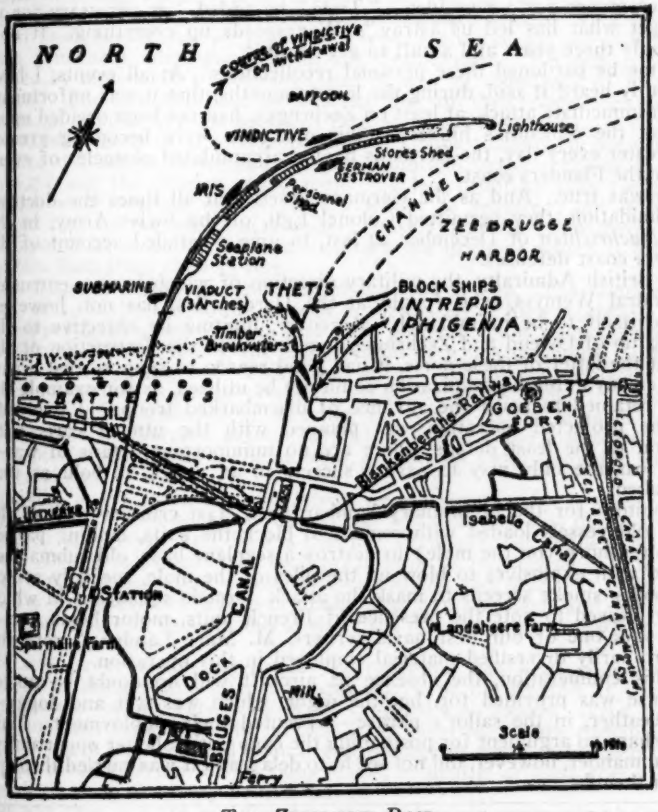
Since the beginning of June we have read of Captain Persius telling the German people that "the German mercantile flag is still banished from the seas." We have had an opportunity to read in German papers advertisements of a new drug produced by Drs. Ehrlich and Lener to be used as "an excellent preparation to still the premature feeling of hunger and thirst, or when food is not forthcoming at the proper time," which is to be "used by persons who are made ill by hunger between meals." And the German authorities responsible for the metal supply have had to issue an official bulletin showing clearly that the "booty" captured as a result of the March offensive did not include as much metal as was originally estimated, adding "the demand for metals, especially copper, continues to be so great that it has been necessary to issue new confiscation orders." It is also distinctly stated that "the metal which is to be confiscated does not merely go to the army, but has to satisfy the whole needs of the war: the navy, the railways, the post and our war industry in the widest sense have to be provided for."

"Especially copper" in the above statement is one of the significant economic factors in showing the influence of sea power on Germany. Out of the 1,002,284 metric tons of the metal produced in the world in 1913, the last complete pre-war year for which complete foreign trade statistics were available, Germany produced 25,309 tons and the United States alone 557,387 tons. Germany was our greatest customer for copper, buying from us more than all the other countries in the world combined. Since August, 1914, the amount of this metal she has been able to obtain from us has been negligible since her ships were driven off the sea by the naval power of Britain, she could get none from Russia, and Austria-Hungary was only able to produce 4135 tons in 1913, which was a fair average of her production. In 1913 Germany's shipping amounted to one-tenth of the world's gross tonnage, the figures being 4,595,095 tons to the world's 46,404,150 tons. Except for her trade with the Scandinavian countries that has been wiped out of existence, and with it Germany's immense profits not alone from her carrying trade in itself but also the profits she manufactured and sold from the raw materials she imported in her own bottoms. Germany had to buy all the petroleum she needed either from the United States, Russia or Rumania, and until the Russian *debacle* and the Rumanian defeat she had been cut off from those sources of supplies since the beginning of the war. Even with control of the Russian and Rumanian oil fields the 85,000,000 barrels these two countries produced in 1916 cannot go entirely to Germany and Austria, and they do not show up very strongly with the 300,000,000 barrels the United States produced in the same year. Just what sea power has done to Germany in the economic sense may be estimated from our foreign trade statistics in 1913. We bought $188,000,000 worth of goods from her and she bought from us goods to the value of $331,000,000. And that annual trade was wiped out of existence through the influence of sea power alone, the withdrawal of the German and Austrian mercantile fleets going into effect before a single shot was fired from a warship at sea.

To Germany her foreign trade is an absolute essential to her economic life. In spite of her great efforts to become a Colonial Power and to make her colonies "in the sun" supply her with raw materials she must have, she has failed miserably in that ambition. Her navy was created to aid in this development and yet now her navy is contained, her colonies are taken from her, her merchant ships no longer furrow the Seven Seas, those ships that supported one-fifth of her population. In one of his most famous passages Admiral Mahan speaks of the "silent watch" the British Navy kept over the French fleets for the four years from 1801 to 1805. The watch they kept then and the "silent pressure" they exerted on Napoleon until the end of his career is being repeated now against Germany and Austria by the Allied navies, with Britain's in the van. Germany may go farther into France and Russia than she is to-day and may "point to the map" as a sign that when she wants to talk peace she is standing in the rôle of the victor. But at heart she knows better. And so long as the German Navy

is only represented at sea by a few piratical craft manned by pirates, while the allied navies contain her fleet and her merchantmen, just so long is she powerless to win the war on land. The land has never won over the sea yet; and not even the Emperor William can change that law. The influence of sea power was never more strongly illustrated than by the example we have before us in the case of the Central Powers to-day.—*Army and Navy Journal*, 8/6.

ZEEBRUGGE AND OSTEND.—*The First Operation on the Northern Front.*—By Contre-Amiral Degouy.—Translated from *Revue des Mondes*, May 15, 1918, by Allen Westcott, Ph. D., Inst. U. S. Naval Academy.—When I heard, on the afternoon of April 23, that the British had just made a serious attack on the coast of Flanders, I could not dismiss from my mind the idea of a large combined operation on this northern front, which, running perpendicular to the western front, presents to the enemies of Germany so propitious a flank for effective counter strokes.



THE ZEEBRUGGE RAID.

Scene of the Recent Daring British Naval Raid on Zeebrugge. The Position of the Sunken Vessels Blocking the Canal Entrance is Shown, Also How the British Ships *Iris*, *Vindictive*, and *Daffodil* Got Alongside the Mole to Land Men. Near the Base of the Mole the Spot is Shown Where a British Submarine Got Under the Piles and Blew Up a Part of the Mole.

The hope was ambitious. We are not at that point yet. The forces which our Allies and ourselves might have devoted to that powerful diversion appear better employed in sustaining the frontal attack of the enemy and preparing a return thrust which might be thought too risky if conducted on the limitless expanse of the sea.

The operation was in reality a much more modest affair, a sharp blow struck at a port which has become famous since the autumn of 1914, when it was abandoned without a struggle to an enemy whose ingenuity, whose shrewd tenacity, was not yet fully realized, to an enemy who well knew how to utilize it for their submarine campaign.

It was at this same period that I myself demanded in these columns that we put ourselves instantly on our guard against this submarine menace, and that, without further delay, we should seek to close the bases from which these redoubtable pirates of the narrow seas were about to emerge.

It appears that, long disregarded, this idea is more acceptable to-day. General Billot once said to me jokingly that it takes 15 years, with us, to gain acceptance for a new idea. "Time," he added, "is necessary for us to forget what has led us astray." War speeds up everything. It now takes only three years and a half to get results.[1]

Let me be pardoned these personal recollections. At all events, I have frequently heard it said, during the last 42 months, that it was unfortunate that an immediate attack, at least on Zeebrugge, had not been decided upon, but that the difficulties hindering this operation were becoming greater and greater every day, the Germans having accumulated obstacles of every kind on the Flanders coast.

This was true. And as the Germans practice at all times the doctrine of intimidation, they permitted Colonel Egli, of the Swiss Army, in the *Basle Nachrichten* of December 22 last, to give a detailed account of the Flanders coast defenses.

The British Admiralty, the military direction of which is now entrusted to Admiral Wemyss, who fought at the Dardanelles, has not, however, allowed itself to be intimidated. Moreover, limiting its objective to the bottling up of Ostend and Zeebrugge together with the destruction of the mole at the latter of these ports, it had good reason to suppose that a part of the enemy defense organization could not be utilized, as for example the forces retained to resist the advance of disembarked troops. I may add that the projected operation was planned with the utmost care, with attention to the least details—there are no unimportant details in war—which was the only way to assure success in an attack as bold as that undertaken.

"Monitors for the preliminary bombardment, fast cruisers to lead the attack, old vessels loaded with cement to block the exits, landing parties to throw ashore (on the mole) to destroy a seaplane base, old submarines charged with explosives to blow up the piles of the mole, specially armed ferry-boats, smoke screens to mask the attack, torpedo squadrons in which we are pleased to note the presence of French units, motor boats, etc.—such," says one of our best naval writers, M. Marc Landry, "were the extraordinarily diversified material employed in this operation.

In this enumeration, the absence of aircraft will no doubt be noted. Their use was provided for, but the night, which was wet and foggy—dirty weather, in the sailor's phrase—prevented their employment. This was perhaps an argument for postponing the coup until a better opportunity. The commander, however, did not see fit to delay, and it was carried through without them.[2]

---

[1] It was then a question of carrying out from time to time combined operations with the army and the fleet, under the guise of grand maneuvers. I advocated this in a work which appeared in 1885-86. About fifteen years later there was an interesting exercise of this nature in the Atlantic, at La Pallice, in which I took part as second officer in the *Valmy*.

[2] According to accounts apparently of official origin, the operation had already been postponed several times "owing to the vigilance of the German patrol."

This determination (the wisdom of which it is impossible to discuss without access to the official reports) was to have two consequences. In the first place, the block ships which were to obstruct the entrance to the harbor of Ostend failed to find their destination and were sunk prematurely. Thus submarines of small tonnage may still get to sea by using the canal from Bruges to Ostend. In the second place, the fire of the artillery at Zeebrugge, especially the machine guns and lighter pieces bearing directly on the mole, was not effectively offset and the damage to attacking units and losses of disembarked personnel were therefore severe (nearly 600 men in all, including 50 officers). Only one British destroyer and four motor craft were sunk.

I have no fear in repeating a remark which I have made before in my discussion of coastal operations (*Revue des Deux Mondes*, September, 1917) that in such attack the assistance of a force of bombarding aircraft is practically necessary. These units are destined to play the essential rôle which in former times developed upon bomb vessels, the mortars of which gave their projectiles an almost vertical downward course. This, however, is far from saying that we should deprive ourselves of the aid of flat boats with armament corresponding to this desideratum. No one is incommoded by abundance of blessings, nor in war by abundance of means of action. The Italians have recognized this in their operations on the Carso, in bombarding the southern face of which they made use of scows armed with guns of the largest caliber. Unquestionably, in view of the marked differences in sea and weather conditions between the head of the Adriatic and the Belgian coast, something less primitive than these craft (which were without motive power) would be required; but it will be agreed that on the banks of Flanders vessels drawing from three to six feet would be more useful than monitors the draft of which is probably not less than from 12 to 15 feet.

Then again, there is the question of the type of gun. The *relative* ineffectiveness of these monitors, as well as the vessels of high freeboard which sometimes accompany them, is that their powerful guns throw shells with a *relatively* flat trajectory, the angle of fall of which is seldom more than 50 degrees or 55 degrees. This is not enough against well-protected coast batteries; neither guns nor crews are brought under sufficiently direct fire. Add to that the difficulty of directing the fire if, at the moment, special aircraft for the purpose are not available, and also the instability of the firing platform if, again at the moment, one cannot await favorable weather and calm sea.[1]

Finally, in the particular case which we are considering, it appears that the fire of the monitors was carried on while it was still dark—another cause of uncertainty and, in this instance, of insufficient artillery preparation. Now it is evident that such preparation is indispensable if the aim is to secure satisfactory results without paying too dear. It is quite as much so in a coast offensive as in similar operations on land; and one cannot avoid surprise that this obvious analogy has not as yet been clearly grasped in certain quarters.

It will be rejoined that artillery preparation has been systematically omitted in certain land offensives—the attack of the English at Cambrai, for example—which were nevertheless crowned with success. True, but the assailant then profited by the advantage of surprise. If the expedition of April were to have secured a similar advantage, it would have been necessary to modify certain dispositions made; evidently, at least, there would have been no preliminary bombardment.

In any case, we are not disputing the preference commonly shown for night rather than daylight attack. This is essentially a matter of circumstances. The chance of surprise in the former may be balanced by the

[1] British reports state that the attack began at daybreak. German reports, on the contrary, speak of a night attack. The state of the weather—foggy and rainy—no doubt accounts for the discrepancy.

greater difficulty of execution. But, when it is a question of closing a channel, when it is a question of steering heavily laden hulks to a precise point in a channel the marks of which have been removed, daylight seems a first essential. Artificial light—searchlights, magnesium, etc.—are not enough.

We come to the results of the affair.

We have noted that the Ostend channel was apparently not obstructed. Was that of Zeebrugge? Very likely, yes. But is it blocked so completely that a submarine or torpedo-boat of small size cannot get through? The question is hard to determine. Our English allies will not delay in finding out.[1]

As regards the mole, or rather the superstructure of that work of art, it appears clear that the damage there was considerable. Twenty-five meters of jetty are said to have been completely destroyed by the explosion of one of the two submarines with a cargo of violent explosives which were so skillfully and gallantly sent against it.[2] Are these injuries irreparable? Certainly not, but during the process of the repairs, which the British can considerably retard, the sand which fills in constantly along the coast will pile up against the sunken vessels and aid in obstructing the channel, the more so since the dredge at Zeebrugge was sunk.

The masonry constructions on the mole and elsewhere appear to have been destroyed, along with some light units posted there. But the damage in this respect is of slight consequence.

Much more important was the destruction of the outer locks of the long canal connecting the port of Zeebrugge with the basin of Bruges itself. Some doubt remains as to this destruction, but a telegram from Amsterdam affirms that William II visited the locks "where the two cement laden hulks were sunk." Was the outer still merely obstructed by these vessels?[3]

As a matter of fact, the Kaiser at once went to Zeebrugge, though his health at the time was not of the best. This hasty visit and the comment of German newspapers gives us a measure at once of the importance of the injury inflicted, the interest attached to the prompt restoration of the Belgian base, and the moral effect produced in Germany by a vigorous and at the same time unexpected stroke.

It must be admitted, indeed, that our enemies have become accustomed to the idea that the allied navies, feeling themselves powerless before the "admirably defended" German coasts, would never undertake anything further than the traditional bombardment of Ostend or Zeebrugge, either by monitors or by aircraft taking a chance of surprise attack, for the German airplane bases, Ghistelles and others are not far off and keep a bright watch. This systematic inactivity of the British fleet raised a ready smile in Germany, after the great battle of two years ago in which the *Hoch Seeflotte* was declared victorious, so much was it surprised at not being destroyed. The hypothesis of an allied naval offensive was thrown scornfully aside. All that these naval forces could do—disconcerted by a war the surprising developments of which they had been unable to foresee and to which they could not adapt their concepts—was to defend themselves against the submarines in their operations at sea.

And thus, on the one hand, was returned to the Allies with interest the injury caused by a blockade rendered at present ineffective by the conquest

---

[1] The Wolf agency declares that submarines and torpedo craft are using both ports as before. But what credence is to be accorded to the Wolf agency?

[2] This part of the operation recalls the frequent attempts of the British, in times past, to destroy St. Malo, Havre, etc., by similar means. The attempts in all cases met with only mediocre success. The explosion took place *in the open;* and no account was taken of the necessity of *directing its force.*

[3] At least as soon as he received the report of Admiral Schroeder, the commandant at Zeebrugge, who is reported to have been removed after the interview.

of Russia; while on the other hand they were prevented from any operation that might disturb the population of northern Germany, cause concern to the government over the safety of the northern flank of its military forces, or give northern neutrals any disposition to oppose the brutal exigencies of Wilhelmstrasse.

This edifice of peaceful security found itself suddenly shaken, just at the moment when it appeared likely at least that the "triumph" of St. Quentin" would bear no fruit, that the enormous sacrifices of human lives, admitted by Colonel von Wrisberg in the Reichstag, would give no decisive result, that the submarine campaign would not accomplish all that was promised, that the Ukrainian peasants were hiding their grain, and that the people were at an end of their resignation, while certain neutrals, whom it was necessary to impose upon, were at the end of their patience.

In England, with us, with all the western allies, on the contrary, this simple *coup de main*, the material results of which are still in some measure disputed, has produced a considerable moral effect and a kind of solace. At last, then, the extraordinary charm was broken which had held this marvelous naval force chained to a coast too jealously guarded against imaginary dangers. And the grand fleet with its enormous units had not been called upon, though one knew well it was ready—in part off Terschelling, Holland—to throw itself upon the *Hoch Seeflotte*, if the latter, warned in time, had sought to interfere.

But better yet, speaking of charms, that which up to this time had protected the German coast suddenly vanished. What! had we dared to attack the best defended port on a coast where the enemy had assembled every means of defense, and had we succeeded, in spite of shoals, mines, nets, guns, devices of every type, in establishing ourselves on the mole of this port and destroying what we wished at the same time obstructing for a long period the channel which for three years and a half had given passage to so many submarines, torpedo vessels and mine layers?

Then it was not immune, this enemy coast; these sand bars could be crossed, and also these barriers of nets and mines? And if the artillery and machine guns, insufficiently silenced by preliminary bombardment, had poured in a murderous fire on the pier, as on the battlefields of the Somme and the Lys, still the admirable devotion and complete self abnegation of officers, sailors, and British marines had overcome this terrible fire at point blank range. Death itself had given way to the will of a heroic band, determined to accomplish precisely the task set for it to do.

What will be the sequence of this operation which has aroused such well justified enthusiasm and given birth to so many hopes? What will be the results in the near future and the influence upon the plans of the Allies? This remains for us to consider.

First the immediate results:

The entrance to Zeebrugge, the most important, is for the time being impracticable.[1] That of Ostend is nearly intact. The movements of German vessels (not only war vessels but a good number of small cargoes which pass back and forth between the Belgian coast and Hamburg) will be directed to Ostend until the obstructions at Zeebrugge are removed.

But, on the one hand, it is the business of the Allies to hinder the repairs at Zeebrugge as long as possible; and, on the other hand, the distance from Ostend to the Belgian front is not more than 18 kilometers, within reach of the long range artillery of the Allies. These took part, according to British accounts, in the operations of the 24th of April; and if unfortunately we cannot at present flatter ourselves on the possession of guns similar to those bombarding Paris, it is certain that we have guns that

[1] Note that it is difficult for submarines and torpedo craft of considerable size to employ as a base of refuge a port which they can enter only under favorable weather conditions, with many precautions, at the risk of collision and injury, and at the risk above all of being subjected to prolonged attack by pursuing units.

can send their projectiles over the 38 kilometers which separate Zeebrugge from the western front, and that for these it will be a simple matter to reach the points in Ostend indicated by the aerial apparatus regulating the fire.

The traffic of this port would be considerably upset if the bombardment acquired some intensity. And we are now speaking merely of bombardment from the land. To this may be added the guns of monitors on the banks which extend roughly parallel to the coast and are separated by deeper stretches or (fosses) with a depth of from six to ten meters at low water. Finally, account must be taken of air raids following each other as frequently as possible. Under such conditions, it is not probable that the port of Ostend would recover the activities carried on before the blow of April 23.

The advantage gained by the latter is thus very marked. But it is evidently based on the condition that the Zeebrugge repairs are not too soon effected. On April 29, it was reported from Holland that the demolition of the sunken hulks was already under way, a fact in no way surprising to those who know the activity of the Germans and the promptitude of their decisions. It is therefore the interest of the Allies to interfere with this work of restoration by every possible means; and it is clear that from a purely material standpoint—which certainly cannot be disregarded—we shall have gained little if, in a few weeks, no traces remain of the brilliant stroke of which we are studying the results.

By every possible means, I have just said . . . . But what?

If we admit—and the operation is itself the evidence—that the best means is still the bombardment of the outer port, on the classical condition that *the bombardment be intense and continuous,* we are led to ask whether the Allies have made sufficient use of this means. I do not know and I do not wish to know the number of monitors at the disposal of the British, to which American monitors may doubtless be joined. We may at least rest assured that there are not enough of them. For three years, I have kept repeating that the naval war will resolve itself into coast warfare, and that it is necessary to create the essental material for warfare of this kind. I would have been surprised if I had been regarded. But there is still time, if not for immediately following up the Zeebrugge raid, at least for operations which this good beginning permits us to anticipate. Whatever our supply of units, we may at least employ them up to the limit of our supply of combustibles and munitions.

Finally, it is necessary to multiply the number of aircraft in ordinary service on the Flanders coast. Certain news sheets constantly repeat the cry, "Airplanes, airplanes." Their clamor is loud, but the counsel is sound. Let us not cease to repeat that we can never have enough of these valuable means of directing a vertical fire on the guns along the German coast.

This is not all, and since the occasion presents itself, I take the opportunity to make a suggestion which I think is a new one but which has haunted me some time, coming from the days when, as commander of the mobile maritime defenses at Dunkirk, I made the proposal to complete the defenses of this important port by building a *fort at sea* on one of the bars which are normally above water at low tide, from 2000 to 3000 meters from the fortifications on shore.

What is the problem before us in considering measures to be taken against the Flanders coast? It is a problem of an organized siege operation, a siege of a position 50 kilometers in length. This curtain has two bastions. That is to say, it is protected at its two extremities, on the east by the neutrality of Dutch waters which prevents flank operations in that quarter, on the west by the shallows of the Flanders banks, which hamper the movements of large vessels without sufficiently interfering with those of smaller units.

Now would it not be singularly advantageous to use these banks to support veritable siege approach works, comparable to those employed on the western front before the latest offensive? These banks, I repeat, are above water at low tide, or at least awash, and while the depth is somewhat greater

in the vicinity of Ostend, it does not increase over a meter. It is thus quite possible to use them as foundations—the sand is sufficiently firm—for the works which, progressively advanced, would approach Ostend and command the exit from the northwest, while the heavy guns of Nieuport could reach the town from the west northwest, and the monitors and aircraft from other quarters.

I have merely sketched the proposal in outline. I may say, however, that in 1899-1900, when I commanded at Dunkirk, the Chef de Ponts et Chaussees pronounced the scheme of a *fort in the sea* perfectly feasible. If the scheme be deemed too difficult or to require too much time (the war, however, will not be over in three months, as we have been told for the last four years), it would be possible to sink some old coast defense vessels on these banks, which would serve very well as sea fortifications.

No doubt by these various means the port could not only be closed but made unsafe for vessels, and the defenses could be reduced to a point where the capture of the town would be possible, an operation the consequences of which are easy to perceive.

But I do not hesitate to say that, serious as such consequences would be, they are not the limit of the hopes stirred by this remarkable action of the British on April 23. No, we should bear in mind not only the Belgian coast but the German coast, the true German coast which, rightly or wrongly, has been regarded as invulnerable, and which, notwithstanding, *cannot be at all points* as well defended as the Belgian coast, which for so many reasons—military, political, economic—our enemies hold with such determination.

I have already discreetly indicated the more vulnerable points of this coast, and I have discussed the advantages of such an offensive, together with the methods it would be advisable to employ with a view to reducing the defenses, which are not—as the recent attack has shown us—and never will be sufficiently strong to stop brave men well led, well supported by the greatest navy in the world, with intelligent tenacity of purpose and well-considered plans.

In these greater undertakings, as in the attack of April 23, we can count on success, even complete success, since we now have not only the prestige of a victory but valuable experience on many points up to this time matters of controversy.

Let us project our view further. Let us see large to see true. Present events, the most revolutionary in long ages, call for the widest and most unfettered vision, while at the same time they force upon us a firm acceptance of certain sacrifices, a general renunciation of superannuated doctrines and peculiar traditions, vigorously defended and not less dangerous on that account.

In short, let us resolve and dare. Germany has got the better of us—at times—only by the boldness of her attacks, the more violent and risky when her position appeared, at bottom, least secure. All past history proves that when she is put on the defensive, especially where she does not expect it, she is troubled, uncertain, disconcerted. Let us then attack—attack on the front first, that she may be everywhere occupied; but later, after adequate preparation, let us attack on the flank she professes to regard as invulnerable. Let us attack her on her own ground.

ADMIRAL WEMYSS COMMENTS ON U-BOAT RAID AND AMERICAN ACTIVITIES.—German submarine activity off the Atlantic coast of the United States should not be taken very seriously, as the Germans probably will not attempt a blockade of the American shores.

This is the opinion of Vice Admiral Sir Rosslyn Wemyss, first sea lord of the British Admiralty. The admiral believes that there is only one submarine operating off the American coast and that the purpose of its trip across the Atlantic was to frighten the Americans.

German ruthlessness at sea, the first sea lord declared, must be met by centralized warfare in the North Sea and the Mediterranean.

Admiral Wemyss paid tribute to the co-operation of the American naval forces in European waters. He said the American ships not only were stationed in the north, but also were operating in the Mediterranean and off Gibraltar.

Effect on Naval Situation.—The appearance of the German submarines off the American coast is an interesting development from whatever point of view it is studied, and opportunity was given this week to Archibald S. Hurd, the British naval writer, to obtain from the British first sea lord his opinion upon this new departure on the part of the Germans and its effect upon the naval situation generally.

Secrecy is an essential element of success in all warfare and particularly in naval warfare, but there are times when a chief of staff can speak with necessary reserve without giving information to the enemy. In democratic countries the leaders of the fighting forces must carry public opinion with them. That has been the policy adopted in increasing measure by the present Board of Admiralty.

The first sea lord was bending over a table at work when the interviewer entered the room. He had cast aside his coat and waistcoat owing to the heat of the afternoon, the windows were open, and there was about the admiral a fresh-air atmosphere.

"This development should not be taken very seriously," he said, in reply to a general inquiry as to what importance he attached to the German sinking of shipping off the American coast.

"*Too Far from Bases.*—If I were inclined to bet, I should say there has not been more than one submarine off the American coast. I may be wrong, but that is the impression I have formed. That conclusion fits in with my interpretation of the enemy's object.

"The Germans cannot hope to maintain anything in the character of a blockade. The distance is too great from their bases.

"The enemy has merely made a demonstration with the hope of causing us to decentralize our efforts to put down the submarine. His object is to frighten the American people in the hope that they may exert their influence on their naval authorities.

"You will remember that Napoleon declared that 'exclusiveness of purpose is the secret of great successes and of great operations.' Now, if the Germans could cause a dispersal of naval force this demonstration off the American coast would achieve its purpose.

"*Holds to Two Principles.*—I hold firmly to two principles. As chief of the staff I believe firmly in decentralization in administration, but as chief of staff I also believe as firmly in the centralization of effort against the enemy. I think it was Admiral Mahan who said that the great end of a war fleet is not to chase nor to fly, but to control the seas.

"Now, with that statement in mind, glance at an ordinary school atlas, if you have not got what the Germans would call a 'war map' handy. You will observe that the central powers have formed a block in Europe running down from the North Sea to the Adriatic and to the point where the Dardanelles debouches into the Mediterranean. Any submarine to reach the American coast has to pass either to the north or south of the British Isles or along the Mediterranean, where Gibraltar stands sentinel over the narrow exit.

"That atlas is illuminating. It indicates sound strategic methods of dealing with the submarine campaign. We must fight the U-boat in the narrow seas. In other words, we must centralize, concentrating all our forces in what is really the decisive area.

"The Germans, you may be sure, have been studying the charts, and in sending one of their so-called submarine cruisers to the American coast they thought to raise an outcry in the United States against the policy which is now being pursued of fighting the submarine in the narrow seas.

"*Already Have Failed.*—Well, I judge both from the official information and cable dispatches in the newspapers that they have already failed in their purpose. It looks as though they had merely brought the war home to the

American people, reminding them in this dramatic way that the seas are all one and that they have a common interest with us and the other allies in conquering the power which invented this modern form of piracy. That represents another defeat for the Germans.

"We shall have to wait on events before final judgment can be formed as to whether the enemy will persist in this new policy. I am not inclined to take the business seriously. It cannot be serious in relation to the immense volume of sea traffic between the United States and Europe. But I must enter one caveat. The proper policy is, as I have said, centralization of effort in the decisive areas, the narrow waters through which all submarines, whether intended to cruise off our shores or off the American coast, must pass.

"That is the right policy, as every seaman will, I am sure, agree, but that does not mean that no submarine can escape and cross the Atlantic. No such guarantee can be given.

"What, then, should be done? I see it is reported that American coast-bound traffic will be convoyed. If that be the case the same principle will be adopted as has proved successful during the past year or so, but this will be a quite secondary effort, I imagine, since, according to the statement made by the Naval Secretary in Washington, the American naval authorities are convinced that if the submarine is to be mastered it must be mastered in the narrow seas.

"*American Resources Developing.*—American resources are developing rapidly and the two policies, I hope, may not prove incompatible, namely, co-operation in the main offensive with a measure of protection to local traffic."

The conversation passed to the manner in which the American naval forces have co-operated in the European waters.

"You know, of course," the first sea lord continued, "that for more than a year past American men of war have been operating from Queenstown. It also has been known for some time that there are American ships in the Mediterranean. I do not think it can be regarded as a secret from the Germans that American men of war are also acting against the enemy off Gibraltar.

"This co-operation constituted a remarkable testimonial to the strategic insight of the American naval authorities, who have not hesitated to send battleships to join the grand fleet in the North Sea.

"*Triumph of Strategic Principle.*—I wonder how many people realize that the decision of the American naval authorities in sending ships 3000 or more miles across the Atlantic to defend American interests represents a unique triumph of a fundamental strategic principle? The naval historian, when his time comes to write, will not be blind to this notable action, and there seems no doubt he will be able to add that the Navy Department was supported wholeheartedly by public opinion.

"And that reminds me to emphasize the fact that the object of the Germans in sending submarines to the American coast to sink shipping was to weaken the concordat between expert and civil opinion in the United States. On that matter there is no shadow of doubt."

Discussing the relations of the two navies, Admiral Wemyss said:

"On the broad lines of strategic policy complete unanimity exists. Admiral Benson and Admiral Mayo have both visited us and studied our naval plans. No officers could have exhibited keener appreciation of the naval situation. I find it difficult to express the gratitude of the British service to these officers and to Admiral Sims for the support they have given us. I am not exaggerating or camouflaging, to borrow a word of the moment. Our relations could not be more cordial.

"*Day-to-Day Procedure.*—The day-to-day procedure is of the simplest. Every morning I hold conference with the principle officers of the naval staff, and Admiral Sims is present as the representative of the United States fleet, joining freely in the discussion of the various subjects which arise. need not add that I keenly appreciate his help. At sea the same spirit

of cordial co-operation exists—extremely cordial. I should like to say we have, fortunately, a common language and common traditions, which have done so much to assist us in working together.

"The American officers and men are first rate. It is impossible to pay too high tribute to the manner in which they settled down to this job of submarine hunting, and to the intelligence, resource and courage which they have exhibited."

"*Came at Opportune Moment.*—They came on the scene at the opportune moment. Our men had been in the mill for many weary months. Possibly the American people, so far removed from the main theater of the war, can hardly appreciate what it meant when these American officers and men crossed the Atlantic.

"They have been splendid, simply splendid. I have seen a number of the destroyers and conversed with a large number of officers. I also have had many reports and am not speaking of the aid the United States has rendered without full knowledge.

"Not only are the vessels well constructed and the officers and men thoroughly competent, but the organization is admirable. It was no slight matter for so many ships to come 3000 miles across the Atlantic to fight in European waters. The decision raised several complicated problems in connection with supplies, but those problems have been surmounted with success.

"There has never been anything like it before in the history of naval warfare, and the development of the steam engine has rendered such co-operation more difficult than ever before, because the modern man-of-war is dependant on a constant stream of supplies of fuel, stores, food and other things and is in need of frequent repairs.

"*No Parallel in History.*—This submarine business will not have any effect on a transport movement which, judged from the standpoint of a seaman, has no parallel in history. A year ago the enemy was boasting that his submarines would prevent American troops being moved to Europe. I do not know whether that statement was ever believed in Germany or whether it was merely put about in the belief that it would make the Americans nervous, but, whichever it was, neither the threats nor the performances of the U-boats have affected the movement.

"That is a very remarkable fact which, judging by the German newspapers, is producing a great impression in Germany. Not so long ago the falling off in sinkings of tonnage was explained by the enemy as being due to the fact that there were few ships to attack.

"And now in the face of that statement American troops are coming across the Atlantic week by week by tens of thousands and moving up to the firing line. At the same time war supplies in great variety are being brought across the Atlantic with comparatively small losses and the food situation in the British Isles is actually more satisfactory to-day than it was a year ago. The people are contented and the general situation so far as it is influenced by the naval effort has improved, although the enemy is making his maximum attack on every ship afloat, British, allied and neutral.

"These results have been achieved by adherence to the only sound strategic principle—concentration of effort."—*Wash. Evening Star*, 15/6.

NAVY APPRECIATES BENEFITS OF UNITY.—Benefits derived from united naval strategy by the United States and Great Britain were referred to here to-day by Navy Department officials, who read with interest the views of Vice Admiral Wemyss on the operation of German submarines off the American coast.

"The navy is naturally much gratified at the appreciative words of Admiral Weymss in regard to naval co-operation in European waters," said Franklin D. Roosevelt, Acting Secretary. "The keynote of our naval policy from the beginning has been a united strategy. It would have been easy to fall into the error of assigning separate zones of operations to the

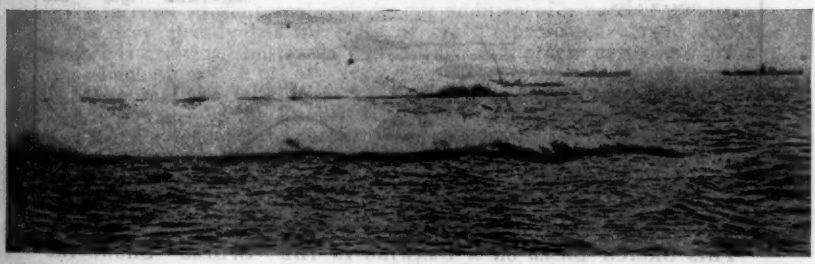
various navies, but it was evident from the first, as Admiral Wemyss says, that the principal naval forces must be concentrated in the decisive area of the narrow seas around England and France.

"With this in mind, the evident German effort to break this concentration by sending raiding submarines to our own coast has failed utterly in its purpose. One submarine, or possibly two at the present time, or even a continuation of the scattered attacks must and will be met on this side by supplementary naval operations without in any way weakening the main effort of hunting the submarines in the narrow seas off Europe, or to convoy troops and supply ships across the ocean.

"That this singleness of purpose is actually succeeding is proved by the fact that the German naval objective which has been often announced for over three years has, up to the present, entirely failed in its purposes. The British and American naval forces at all points are working not only in complete harmony but with a constant interchange of ideas that is improving the efficiency of both services."—*N. Y. Herald*, 16/6.

LESSONS OF THE WAR

THE PROTECTIVE VALUE OF CONVOYING.—The gradual breakdown of submarine warfare is not attributable to any one anti-submarine device but to the cumulative effect of many such. If there is a measure that stands out as preeminently successful in cutting down losses, it is the introduction, or rather the reintroduction, of the convoy system—for convoying was well known and extensively practiced in the days of Nelson and the sailing frigate.



SMOKE BOXES THROWN OVERBOARD TO HIDE A CONVOY FROM THE SUBMARINES.

When it was decided to reintroduce convoying, there was practically no experience to draw upon; for it was evident, at once, that dispositions of ships in a convoy which were effective in the days of sail power might be altogether unsuited to this age of steam power. Various formations were tried, and the present effective practice was ultimately developed.

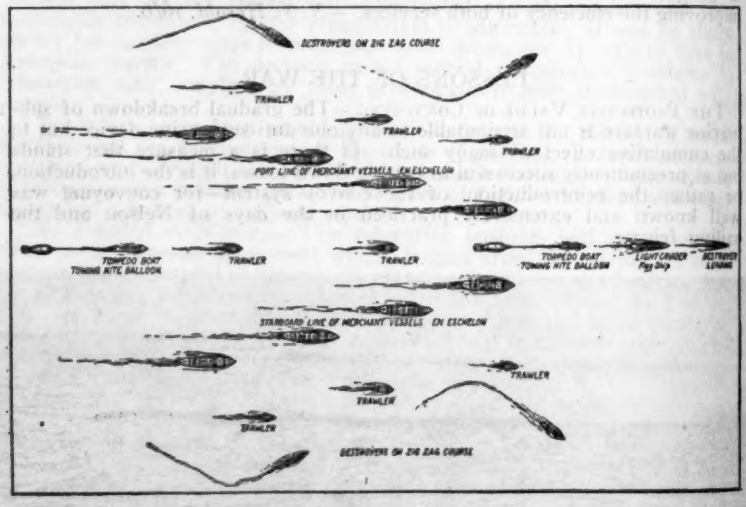
In the accompanying diagram, is shown the wedge or V-shaped formation, in which the convoyed merchant ships steam in two echeloned lines.

The disposition, both of the war and merchant vessels, is, at first sight, rather complicated; but actually is not so. It is most admirably adapted for getting an early sight of a submarine and putting it out of commission, or driving it away from the path of the convoy.

At the head of the convoy is a destroyer; following this is a light cruiser which acts as a flagship. This, in the case of our own navy, is frequently an armored cruiser of the former *Colorado* or the *Tennessee* type. Then, astern of the cruiser is a torpedo boat which tows at the end of a light, but very strong steel wire, a captive balloon. This craft forms the point of the "V" formation; and behind it are placed the two diverging lines of merchant ships which follow each other, not bow to stern but disposed

diagonally. At the stern of each ship is towed a spar or buoy which serves to tell each succeeding ship how far it is astern of the ship ahead—an absolutely necessary precaution at night or in thick weather. Down through the center of the "V" is a line of armed trawlers; and another line steams on the outer side of each column of merchant ships. Slightly astern of the convoy and at about the center of the base of the "V" is a destroyer or torpedo boat which tows another observation balloon. Finally, to complete the protection, several destroyers steam in a zig-zag course well out on each wing of the convoy.

The efficiency of the system was recently alluded to by Sir Eric Geddes in the House of Commons. He stated that one result of the convoy system has been to drive the enemy closer to the shore, thus rendering the open sea safer for navigation. During the first months of the unrestricted submarine war 50 per cent of the losses (of merchant ships) occurred more than fifty miles from land, and only 21 per cent within 10 miles of the



THIS SKETCH BASED ON A DRAWING IN THE "SPHERE" SHOWS THE POSITION OF SHIPS IN A CONVOY.

shore. To-day the losses outside the 50-mile limit have fallen to one per cent, while the losses close to land have risen to 61 per cent. This transfer of attacks nearer the coast gives increasing opportunities for attacking the enemy by patrolling surface craft and airplanes, and enables us to save many vessels which otherwise would have been lost.—*Scientific American*, 1/6.

ZIGZAG TACTICS AID SHIPPING.—British submarine commanders attest the value, from their own experience in trailing enemy warships, of the zigzagging tactics used by allied shipping in dodging U-boats. All agree that an irregular course, coupled with speed, makes the fleeing vessel a difficult target.—*N. Y. Herald*, 16/6.

ATLANTIC

NAVAL OPERATIONS.—A British freight steamship reaching an Atlantic port on her maiden voyage reports sinking a U-boat off the Irish coast.—*Digest*, 18/5.

The British Admiralty made this official announcement on May 25: "One of our Atlantic escort submarines, returning to its base, reports that on May 11, in the latitude of Cape St. Vincent, while proceeding to meet a convoy, she sighted and sank a German submarine of the scout cruiser type. A heavy sea was running at the time. There were no survivors. Shortly afterward another enemy submarine was sighted, but by swift diving she escaped the fate of her consort. This being the first cruiser submarine destroyed, it has been decided to depart from the usual rule of not announcing the destruction of individual enemy submarines.—*Army and Navy Journal*, 8/6.

SPANISH STEAMSHIP SUNK DESPITE FLAG.—The torpedoing of the Spanish steamship *Luisa* by a German submarine was reported to-day in a despatch from Barcelona. Her captain, the despatch declared, reported to the Spanish Government that the ship was sunk in broad daylight and that the Spanish flag was flying where the submarine's commander could not help seeing it.—*N. Y. Herald*, 8/5.

AMERICA INCREASES BIG NAVAL PATROL IN FOREIGN WATERS.—The Navy Department let it be known officially to-day that the United States naval patrol in foreign waters is being increased. As a result the anti-submarine work is improving and the department declared that it is heartened by the progress now being made. It was stated, however, that the improvement now noted should not be regarded as a criterion for the entire summer, for such confidence might be misplaced and might prove enervating.

The department indicated that the U-boats may burst forth into new activities again and reap an enormous harvest, but as a whole it was felt they are being curbed.

The increase in the patrol includes the addition of a number of aircraft.

The navy already has all types of craft represented abroad and the number is growing constantly, particularly as the new destroyers are put into commission.

It was said officially that the department believes the Ostend and Zeebrugge raids by the English have had a salutary effect and that these have had the tendency to curtail the operations of the submarines.

Reports have reached the navy of a German super-submarine, but thus far these reports are not substantiated. It was said there is some reason to believe, though, that Germany is actually mobilizing a number of these with a greater cruising radius and stronger fighting power than any heretofore constructed.—*N. Y. Herald*, 21/5.

NAVAL LAUNCH "OZARK" LOST.—Loss of the naval motor launch *Ozark* with one member of her crew, Charles E. Richards, fireman, of Chipley, Fla., in a heavy sea off the coast May 12, is announced by the Navy Department.—*Evening Star*, 4/6.

OIL TANKER TORPEDOED, SUNK BY ENEMY U-BOAT.—The Navy Department has received a dispatch from Vice Admiral Sims stating that the U. S. S. *William Rockefeller* was torpedoed and sunk by an enemy submarine in European waters May 18.

Later reports indicate that one engineer officer and two men of the engineer force were killed, names not yet known. Eleven officers and 61 of the crew have been landed, none seriously injured. The *William Rockefeller* was an oil tanker of 7157 tons gross.

Morris Miller, 3 East 105th street, New York, a hero of the torpedoed *Antilles*, was paymaster on the *Rockefeller* and had crossed the war zone nine times before the present trip. He was on the *Antilles* when it was torpedoed and given up as dead but, after floating four hours, was picked up by the *Alcedo*. The *Finland*, on which he was coming back to this country was torpedoed.—*Evening Star*, 22/5.

LONG VIGIL GETS U-BOAT.—*Assailant of Tanker Captured After Two Days of Waiting.*—Hovering for two days over the sea where the American tanker *William Rockefeller* had been sunk by a German submarine, a flotilla of destroyers and two seaplanes finally succeeded in capturing the U-boat, according to naval officers, survivors of the disaster, who have landed here.

The sea for miles about the spot where the fatal blow struck the tanker was closely watched by destroyers and their accompanying seaplanes for any sign of the U-boat speeding from the scene of its encounter. No trace evidently was seen, for the boats stayed in the neighborhood and waited. At last the submarine, which had stayed below the surface so long that its air tanks had become exhausted, rose to the surface. It was netted.—*Evening* Star, 4/6.

The U. S. S. converted yacht *Wakiva* was sunk in European waters in a collision on May 22 with a loss of two men. The lost were: W. B. Hoyt, carpenter's mate, Attleboro, Mass., and Joseph H. Farley, fireman, Chicago. The *Wakiva* was formerly owned by H. S. Harkness. She was rated at 863 tons.—*Army and Navy Journal,* 8/6.

The captain of a British steamer, which arrived at Newport News, reports that on May 21 he fired five shots at a submarine 150 miles off the Virginia Capes.—*Literary Digest,* 8/6.

The British transport *Ausonia,* of 8153 tons, which left a British port May 25 bound west, was torpedoed by a German submarine when several hundred miles out in the Atlantic. Ninety of her crew of 130 were picked up and safely landed and search was made for others of the missing. The *Ausonia* was built in 1907 and was owned by the Cunard Line. She had a speed of 14 knots.—*Army and Navy Journal,* 15/6.

TRANSPORT SANK TWO SUBMARINES.—The British transport which was reported to have rammed and sunk a German submarine on the other side arrived here to-day with her stem twisted by the collision. She was in dry dock at a British port to have her hull inspected for any damage that might have been done when she cut through the U-boat and sent every member of the crew to the bottom of the sea.

The first report received by *The Times* stated that 18 survivors had been rescued from the U-boat after she sank. This was corrected yesterday by officers and crew, who were on deck at the time, and were witnesses of the incident with 1000 or more soldiers standing on the deck beside them. They said the transport destroyed two submarines that morning, which was on Sunday.

Just at dawn the Captain was on the bridge with the chief officer, as great caution had to be used in navigating a mine field. Suddenly out of the haze which hung over the water the chief officer saw a big U-boat well above the surface, and said to the captain: "What shall we do, sir?" and the commander, without a second's hesitation, replied: "Sink her."

The U-boat was about two points to starboard at that moment, and instantly the big liner swung over and she crashed through the thin steel hull of the submarine. Almost at the same moment the lookout man in the upper crow's nest shouted: "Submarine on the port quarter, sir."

A short distance away in the haze there appeared another U-boat, which had apparently been in company with the other one, lying in wait for the American transports. Bang! went the six-inch gun on the port quarter, and 110-pound explosive shell struck the submarine squarely amidships and sank her.

The American soldiers on deck forward cheered at the ramming of the submarine and were joined by their mates who were standing aft when the second one was sunk.

The haze was thicker astern of the transport than it was ahead, and this hid an American destroyer from view as she lay hove to waiting while temporary repairs were being executed in the engine room. The warcraft was only a mile away fom the transport when the U-boat was shelled and as the submarine went down those of the German crew who had been able to scramble on deck jumped into the water. The commander of the destroyer saw them drifting toward his ship and had a lifeboat lowered which picked up four officers and twenty-seven of the crew. Search was made to see if there were survivors from the submarine that had been rammed by the transport, but no trace of her crew could be found.

It was said that this was the first time that any merchant vessel or auxiliary cruiser or transport had sunk two submarines at the same time since the beginning of the U-boat warfare in the early part of 1915. For ramming one submarine the captain of the transport, who had been well known in Atlantic shipping circles for the last 20 years, will receive £1000 from the British Government, and he will get an additional prize for the second one.

The double killing caused great excitement among the American soldiers on board, who were on their way to the front. Only a limited number could be on deck at once, and the remainder had to get the news from them when they reluctantly went below to breakfast.

Those who saw the two U-boats at close range said thay were at least 250 feet long, of 27 feet beam, and about 6 feet freeboard. Although the stem of the transport cut through the hull of the submarine as if it had been card board, the shock was felt all over the ship.—*N. Y. Times,* 9/6.

LOADED TRANSPORT RAMS A SUBMARINE.—A transport which has carried many troops across the Atlantic and to Mediterranean ports since the war began in 1914 rammed and sank a big German submarine on May —. There was no mistake in the matter, as the liner picked up 18 of the crew of the submarine and took them into port.

The transport left an Atlantic port with many American soldiers on board. She was steaming rapidly in fine weather, and was not escorted because it was considered improbable that any of the U-boats would take the risk of approaching her.

The captain was on the bridge at dawn looking out for submarines and mines. Acting under instruction he had deviated considerably from the usual course and was expecting to make port and land the troops during the forenoon.

There was a slight haze on the water which probably prevented the commander of the U-boat from seeing the ship, when he merged about two points off the starboard bow of the transport. The captain of the ship saw the submarine first, and, without allowing any time for a torpedo to be got ready, he swung his ship over and bore down on the craft as it started to submerge. The sharp bow of the ship, with her great momentum behind it, cut through the thin plates of the U-boat, and in less than two minutes the latter had disappeared, leaving some of her crew struggling in the water.

The attacking ship circled around and dropped one of the lifeboats hanging at the davits on the port side, which rescued 18 of the Germans, who were trying to keep afloat and shouting to the ship for help. The remainder of the submarine crew were drowned, going down with the vessel after the collision.

The shock when the ship struck the U-boat was so slight that the American soldiers sleeping on the lower decks did not know anything had happened until they felt the ship swinging around before the lifeboat was lowered.

After the ship had circled around for some minutes a line was thrown to the lifeboat, which was hoisted up to the davits again, and the troop ship proceeded on her way to port.—*N. Y. Times,* 26/5.

U-BOAT IS SUNK IN ATTACK ON TWO BIG AMERICAN TRANSPORTS.—Two of the largest transports in the United States service, convoyed by eight swift destroyers, were attacked by a German submarine of the latest "super-dreadnaught" class in midocean and the submarine was sunk by the destroyers, according to the crews of the two transports arriving at an American port yesterday.

The transports, which had been passenger-carrying vessels of one of the big German lines before the war, were on their way to the United States with only a few army officers on board. On the fourth night out the naval officers became aware that a submarine was pursuing them. Delicate instruments are said to have warned them of the pursuit of the submarine.

Extraordinary precautions were taken the rest of that night, last Friday, and with dawn the transports began to zigzag inside the cordon of circling destroyers, with their gun crews ready to fire instantly.

Fake Periscope Detected.—A little after eight o' clock a lookout high on the mainmast of one of the transports, the second largest in the service, gave the cry:

"A submarine on the starboard bow, sir!"

Sirens instantly blew a blast and the gun crews on board the two transports began to train their guns on what appeared to be a periscope four points off the starboard bow of the larger transport and between the two great troop ships.

But quickly the officers saw that the object was a fake periscope. Therefore they ran their fleet little destroyers quickly to the port side of the menaced transport, and there they saw the periscope of the real submarine just emerging. She was a big one, with six deck guns, two of them of eight or nine inch caliber. She was said to have been the heaviest armed German submarine yet encountered.

Depth Bombs Prove Effective.—As the submarine came up she was swinging in position to discharge a torpedo at the great transport. But through her periscope she saw the approaching destroyers and submerged so quickly that not a shell could be fired at her. As she went down one of the destroyers went directly over her and dropped a depth bomb, which exploded with such terrific force that the transports, then 600 yards away, were rocked.

Three destroyers raced back and forth dropping ten depth bombs, while the five other destroyers circled the transport and spread a smoke screen to protect them.

Officers of the destroyers which dropped the depth bombs reported to the transports that they were certain they had hit and sunk the giant submarine. Their proof was a large mass of black oil which floated on the surface, indicating that the submarine had collapsed under water. The destroyers convoyed the transports until Tuesday.—*N. Y. Herald*, 31/5.

U-BOATS OFF SHORE.—*Franklin D. Roosevelt, Assistant Secretary of the Navy, Discusses the Possibilities and Purposes of Germany's Submarine Attack.*—However much the U-boat attack on shipping off the American Coast may have startled the people of this country, there was one place where thinking was not for an instant diverted from its sure course. That was where most was known about the destructive powers of the submarine—in the Navy Deparment. There the attack was considered in all the aspects of its possibilities and its purposes.

Why did the Germans, at vast risk to their boats and crews, decide to deliver an attack on American shipping along the Atlantic Coast? What did they hope to accomplish? What was their strategy?—for it is certain that they thought out, in accordance with their psychology every prospective advantage. Franklin D. Roosevelt, Assistant Secretary of the Navy, when asked for an answer to these questions, replied:

"Let us, in the beginning, try to look at this from the standpoint of the German Admiralty. In the first place, it is safe to state that they have one main naval object at the present time. That is to destroy the shipping of

the United States, if possible. The second question, as far as we can see into the German mind, is: Where is that American shipping?

"To be sure, there is a certain amount of shipping which goes up and down our coast or which runs to West Indian or South American ports. But the shipping in this trade is mostly small and unimportant, and the cargoes carried are not of great military importance. Therefore, from the point of view of doing damage that will hurt us in a military sense, Germany can gain most by striking primarily at our transatlantic vessels. It follows that it will not pay her to conduct regular operations against coastwise ships, and that this attempt against coastwise schooners and other vessels must have as its object something else than the amount of shipping that might be destroyed.

"Now, before attempting to say what that object is, let us look at the attack from the other point of view—our own: If Germany is going out for transatlantic vessels, where can she best strike them? From Germany's home ports of submarines to the sea area off the coasts of France, England, and Ireland, is a matter of only two or three days. That means that a submarine after reaching that locality can stay two or three weeks before she must return for oil and provisions. If, on the other hand, the submarine crosses the ocean to our own coast the voyage would itself take nearly two weeks, and the length of time it could operate off our own coast before being forced to return for fuel would be only one week. The net result,

BIG GERMAN SUBMARINE PREPARING TO ATTACK.

on the basis of these comparisons, is that the German submarines can operate against our shipping at least twice as long if they conduct their operations nearest their own bases.

"Much has been said about possible submarine bases on this side of the ocean. These bases could be either shore bases or floating supply ships. Of course, if such bases existed the length of time enemy submarines could remain on our coasts would be greatly increased. The Navy Department has constantly maintained a large organization for the special purpose of searching out any possible bases either within the United States or at neighboring points in the West Indies or in Mexico. It is impossible to state flatly that no bases exist, but it is possible to say that careful and consistent search has failed to reveal any.

"Why, then, are they doing it?

"First, merely to carry out the known German system of terrorizing the enemy; second, in this particular case, it may be the definite belief of the German Admiralty that this campaign will force the United States to withdraw destroyers and patrol vessels now in European waters in order to protect our own coasts. To do this would be playing directly into the hands of the German Admiralty, because, as it has been seen by what I have said before, it pays them better to attack our ships on the other side and not here; if we withdraw destroyers and patrol boats from the other side it would make it that much easier for the Germans in their chosen field of operations.

"We must realize, therefore, that while Germany may and probably will continue to send occasional submarines to our own coasts, and while these submarines may occasionally sink ships off our shores, we must regard their operations as secondary.

"This does not mean that we must not use every available means to protect our coastwise shipping and to make it dangerous for the submarines of Germany to appear here, so long as we do not weaken our anti-submarine operations on the other side. This the Navy Department is doing with every resource at its command.

"The summer months are, of course, the best for a transatlantic voyage by German submarines, but they are also the best months for our operations against German submarines in these waters, by the use of patrol boats and other craft not large enough to send across the ocean.

"The navy does not anticipate anything like a successful blockade of our coast, and while occasional losses must be expected, it is important to emphasize again that we must not be diverted from our main purpose of getting troops and supplies across the ocean with the greatest regularity and in the greatest numbers possible."

In answer to a question as to the ability of the navy to meet convoy needs Mr. Roosevelt said:

"As the number of merchant ships increases, the number of available navy ships for convoying purposes will also increase. It may be said that as far as the actual safety of ships goes the presence of German submarines on this coast does not increase the danger."

There are two sets of opinions in Washington as to the interpretation of Germany's submarine attack along our shores: One, that it is a desperate move of the enemy, on approaching the end of a losing submarine warfare; the other, that it represents an extension of Germany's underseas campaign. The former opinion is held by T. S. Butler, who has been a member of the House Committee on Naval Affairs for 22 years and is one of the three members of that committee, which confers with the Senate Naval Affairs Committee.—*N. Y. Times*, 9/6.

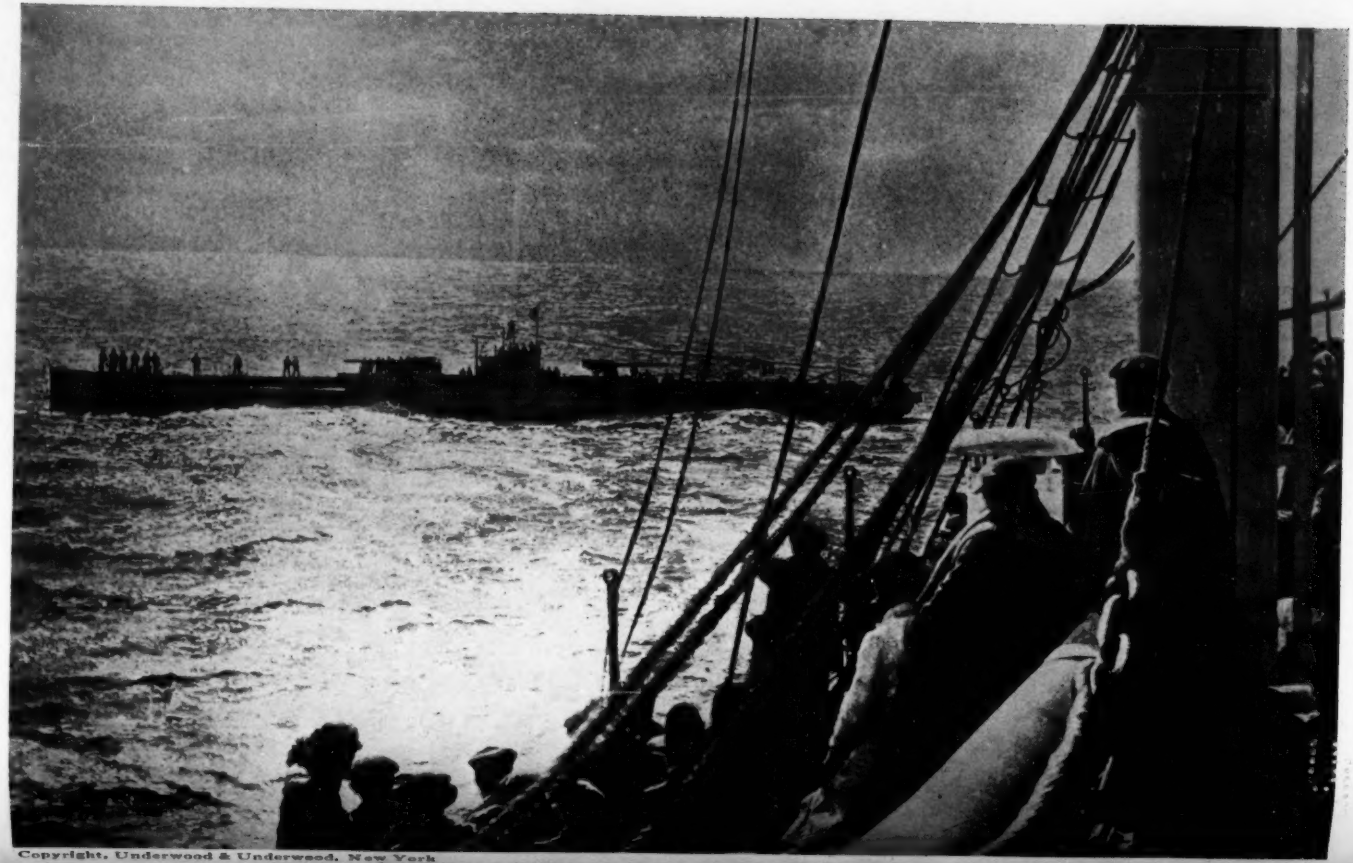
PRESIDENT LINCOLN SUNK.—The United States transport *President Lincoln*, formerly a Hamburg-American liner, was torpedoed last week while on a return trip to this country. According to the Navy Department, the transport was attacked by a submarine at 9.53 a. m.. on May 31, was struck by three torpedoes, and sunk in 18 minutes. The submarine was not seen until after the torpedoes were sighted. The command to abandon ship was carried out in excellent order.

The attacking submarine was about 200 feet long, and was not of the cruiser type. American destroyers went to the rescue. As they were returning to port with the survivors a submarine was sighted at noon Saturday, and attacked by a destroyer.

All the passengers, including the sick, were saved, but three officers and 23 men of the crew are reported to be missing. The small loss of life on the *President Lincoln* was due to the thorough discipline of the ship's company and excellent seamanship of the commanders and officers of the vessels concerned, particularly the commander of the transport.

The *President Lincoln* was of 18,168 tons gross and was built at Harlan & Wolff's yard at Belfast in 1907, for the Hamburg-American line and arrived in New York on her maiden voyage on June 10, 1908. She had accommodation for nearly 4000 on her four decks and could carry 12,000 tons of freight. She was looked upon as one of the finest ships in the Atlantic trade. The *President Lincoln* was 598 feet long, 68 feet beam, and 48 feet 3 inches depth of hold.—*Nautical Gazette*, 8/6.

AMERICAN CONVOY UNDER TWO ATTACKS.—German submarines were foiled in attempts against a convoy which included ships carrying American troops and American Red Cross workers, according to the Rev. Father Joseph Wareing, of Baltimore, one of the Red Cross party, and



Copyright, Underwood & Underwood, New York

His German Submarine Stops Spanish Liner Off Cadiz.

who arrived in London yesterday. The protecting destroyers got into action quickly on two occasions, but Father Wareing did not know whether any submarines had been sunk.

To *The Associated Press* Father Wareing, who had a trying experience following the torpedoing of the British steamer *Laconia* in February, 1917, said:

"Soon after we reached the danger zone our convoy was attacked by German submarines and for a few minutes I thought I was in for another experience of the same kind as I had on the *Laconia*. The exact number of the enemy U-boats was not determined, but at least two were seen.

"We had a lively escort of British destroyers, however, and they were on the trail of the periscope like a flash. Guns and depth charges began popping like giant firecrackers on the Fourth of July. Fifteen depth charges were dropped into the nest of German submarines. Whether any submarines were sunk I cannot say for we were on a fast ship and enveloped in smoke, but I know we did not lose a single ship. Our convoy carried a large number of American troops—I cannot tell you how many.

"When the first alarm was sounded for the passengers to go to their lifeboat stations late on Sunday afternoon I was in my stateroom. Word was passed around that enemy submarines had been sighted. I had no sooner reached my station than depth charges began to explode, shaking our ship. After a few minutes of anxious waiting at the lifeboat stations we received the signal:

"'The enemy has been beaten off.'

"Discipline on board was superb. The troops behaved as if a submarine attack was part of the everyday routine, and there was not the slightest flurry anywhere on board. For coolness in time of emergency I do not think you can beat these young Americans. Their nerves are like steel.

"Two hours later on the same day while I was preparing for dinner another alarm was sounded, and almost simultaneously the destroyers began dropping depth charges. One landed within about 500 yards of our ship and gave it a good shaking. At no time during either attack did I see a periscope or the track of a torpedo.

"When the first alarm was sounded I have to admit I felt a certain nervousness, for the alarm bell brought back to my mind with great vividness my *Laconia* experience, when I suffered considerably from exposure. As I hurried on deck I think almost every detail of those awful hours which followed the *Laconia* sinking came back to my mind like a moving picture, and it was several minutes before I got complete command of myself."

After the sinking of the *Laconia* on Feb. 26, 1917, Father Wareing was in the same lifeboat with Mrs. Mary E. Hoy, of Chicago, and her daughter, Miss Elizabeth Hoy. Mrs. Hoy and her daughter both died of exposure and were buried at sea.

Among the other members of the Red Cross party, were Professor Dexter of Panama, Professor Whitford Shelton of the University of Pittsburgh, the Rev. William Colton of Tarrytown, N. Y.; the Rev. Robert Coupland of New Orleans, the Rev. James Conover of East Greenwich, R. I., and Elton Clark, of Boston.—*N. Y. Times*, 9/6.

Thrilling and dramatic and revealing how the traditional courage, coolness and discipline of the American navy in time of danger was upheld in the sinking of the United States transport *President Lincoln* is the story related to the *Herald* yesterday by Lester Neuberger, of No. 26 Park Place, an enlisted man in the navy and one of the survivors.

With the side of their ship torn by a torpedo from a German submarine 500 miles off the French coast on the morning of May 31, the American gun crews kept firing while the transport settled beneath their feet. Commander Percy W. Foote, in command of the transport, remained on the

Copyright, Underwood & Underwood, New York

bridge, giving orders through a megaphone as calmly as though he were entering a friendly port.

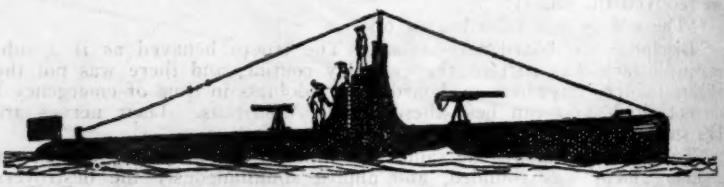
At the solicitation of his subordinates, Commander Foote and his executive donned seamen's uniforms and thus escaped capture when the U-boat commander made a search for them. The Huns, however, took prisoner Lieutenant Edouard V. M. Isaacs, who was ill and unable to disguise himself.

The 688 survivors made their escape in boats and on rafts and were picked up by destroyers after drifting for 16 hours. Neuberger drew a vivid picture of the men singing as the *President Lincoln* sank and the submarine wove in and out among the groups of survivors on the fruitless search for the commander.

Undisturbed by the danger, one of the seamen sat on a life raft and drew the sketch of the submarine which the *Herald* here prints.

Neuberger said that the German commander was a man of fine appearance and spoke faultless English. He described an unusual incident in submarine warfare as carried on by the Prussians by telling how they took a seaman, C. E. Anderson, who was ill, from one of the small boats and released him after giving him coffee, hardtack and cognac.

Neuberger declared that the crew of the transport had been in France but six days and began the return run in good spirits. "We were called on deck at a quarter to three o'clock as usual on May 31," he said. "The



AN EYEWITNESS' VIEW OF THE U-BOAT WHICH SANK THE "PRESIDENT LINCOLN" IS SHOWN IN THE SKETCH ABOVE, DRAWN BY AN AMERICAN SEAMAN WHILE THE VESSEL WAS SINKING AND THE U-BOAT WAS APPROACHING TO TAKE PHOTOGRAPHS OF MEN IN BOATS AND ON RAFTS.

order 'All hands on deck, up all hammocks!' came from our 'Jimmy Legs,' for it is compulsory that every man on board a transport shall be on the open deck from dawn till sunrise, just as he must be from dusk until dark, with lifebelts on. Dawn on the morning of May 31 was at a quarter to three o'clock. Besides having to be on the open deck during those two periods morning and evening, we also must sleep with all our clothes on, including shoes, while we are in the so-called war zone. We are not permitted to turn in for the night until officially notified to do so.

"*Explosion Follows Alarm.*—On this particular morning everything went well until after mess. I was below primping up for 'assembly,' when at about ten minutes to nine I heard the general alarm sounded. For perhaps 30 seconds I believed that it was a call for special drill, but a fearful explosion that came then made me realize that the alarm had been the real thing and that a torpedo, or possibly a mine, had 'gone home.'

"It afterward turned out that the torpedo that struck the *President Lincoln* struck her side not 100 feet from where I was in my 'shop.' I made my way as quickly and quietly as I could above.

"The discipline among the boys was wonderful. Everybody moved without the slightest trace of excitement, although everybody below at the time knew that we had been fairly struck and that it was a question of taking to the boats and quitting the good old ship.

"My station was that of 'man the falls,' which duty is to handle the lines for lowering the boats, to which I had been previously assigned.

"For a time it looked as if the *President Lincoln* would not sink. When I came on deck there was a severe list to port, from which the big ship righted herself, however, very quickly, and remained on an even keel for what seemed, of course, a much longer time than really passed. The inrush of waters probably caused the ship to list heavily to starboard, the side I was on. It seemed that I could almost touch the top of the waves as they washed up underneath my station.

"The weather was all that we could wish for and this, added to the absolute discipline among the men, made it possible for us to get all of the 688 survivors safely into the boats and to the rafts that had been launched when the first general alarm was given, and also to bring back in safety every man of them to France after some 16 hours in our frail craft on the big seas.

"*Gave His Orders Calmly.*—The *President Lincoln* was hit exactly at three minutes to nine a. m. and sank exactly at twenty minutes after nine a. m. It was an inspiring sight to see the commander on the bridge with his megaphone giving orders just as calmly as if we were merely maneuvering out of a harbor instead of getting away from a sinking ship as quickly as possible.

"Another thing that will, forever, remain in my memory as a most wonderful spectacle was to see Nos. 1 and 2 gun crews, forward, remain at their posts and fire at the submarine while the *President Lincoln* was slowly settling under their very feet. It was as if the good old ship, in her dying struggle, was even then trying to destroy the elusive assailant that had given her her death blow.

"During this firing at the U-boat, the men from the transport went overboard like frogs into a pond, that is, those who were making for the big rafts that were floating near the ship's side.

"As the seventh shot was fired the gun crew got the 'abandon ship' order and quit.

"The transport's stern was settling all the time, but all hands, except the 26 missing, of whom three were officers, were well clear of the vessel when she took her final plunge, stern first.

"There was a terrific rush of air from the ventilators that we could plainly hear, a considerable distance away. We expected the boilers to explode sooner than they did. When they did, there was a loud yet dull roar and the single funnel, which at the time was half way under water, was lifted into the air and came back into the ocean with a great splash.

"All the men in the boats and on the rafts were singing 'Over the Bounding Main,' 'Hail, Hail, the Gang's All Here,' 'We May Be Gone for a Long, Long Time,' 'If Mother Could Only See Us Now' and 'Many Brave Hearts Are Asleep in the Deep.'

"The boat in which I was bumped into a depth charge which was afloat on the top of a chest. You can imagine we pulled away from there on the double quick.

"*Fight Against Old Neptune.*—Of course there could be no help from the other ships, as the rules are to scatter when one vessel is hit. But the wireless from the others, as well as our own wireless, had notified the fleet headquarters and we knew that destroyers would be sent to pick us up if we could only fight off old Neptune long enough.

"We had hoisted makeshift signals of all sorts. In our boat we had one made from an officer's undershirt, which he obligingly donated.

"Very soon after we had seen the *President Lincoln* disappear the U-boat came toward us.

"Now, since sailors on the sea are the same as soldiers on the field, all of us thought that the Germans would open fire on our boats and destroy us as legitimate prey, so that we would be combatants no longer. But nothing of the sort happened.

"The commander of the U-boat was the handsomest chap I ever saw and he spoke faultless English.

"He and his men hove to a little distance from us and calmly took shapshots with cameras from the deck of the U-boat! After they had taken all the pictures they wanted, from a distance, they came alongside the boat I was in, with several of our other boats clustered nearby, and took some real 'close-ups' of us!

"When that was over with they put away their cameras and began moving from boat to boat, inquiring for the commanding officer of the *President Lincoln.*

"For very good reasons they did not find the commander, nor any of the officers except First Lieutenant Isaacs, who was too sick to disguise himself, and who was taken prisoner on board the U-boat.

"The commander, at the urgent solicitation of his men, had donned a sailor's uniform and had taken his place at one of the oars. So had the executive officer of the transport.

"But a sort of intuition made every man of the survivors say that the commander and the executive officer had gone down with the ship when they were questioned by the U-boat commander.

"The U-boat commander's rank I would like to know. All he had on his sleeve was a crown. He and his crew remained with us for five good hours, questioning us and looking for the captain and the executive officer, and every now and then again taking snapshots of us in our boats and rafts.

"When the U-boat drew away and disappeared at three o'clock that afternoon we got all our boats and rafts together into a sort of drifting community, and then one of our officers took stock of what we had in the way of smokes. He collected all we had and then divided equally the stock of cigarettes and matches.

Found Cigarettes in Satchel.—"In my boat there was an army officer who had a satchel and who had not volunteered to declare, as all of us other fellows had done, just what he had in the way of cigarettes and matches. A little later he got to be very seasick, and when one of our men took a chill and there was no clothing to put around him, somebody opened the army man's satchel to see if there was anything in the way of clothing in the bag. The army man was too sick to notice what we did. In the satchel we found some heavy underclothing for our man who was ill and at the bottom of the bag, we found several large cartons of cigarettes that the army man had not cared to disclose he possessed. You may be sure that we took everything away from him and divided the loot among all hands in all the boats.

"In emergencies such as the one in which we found ourselves, we are not allowed to touch food or water for 12 hours, if the chances of rescue seem far off. That is a precaution in order to make the supplies last as long as possible.

"We had not yet touched the food or water, when, at 11 o'clock that night we sighted a flickering light. It came nearer and nearer. It was a destroyer, which had reached the scene of the actual torpedoing at seven p. m., but, as we had drifted a long way off, had not found us until 11 o'clock.

"I learned afterward that two destroyers had come and had circled a ten-mile radius, but, as we had drifted 18 miles, they had not found us, and had then begun a second ten-mile circuit, when they finally came upon the place where we were. The second destroyer soon came up, and by one o'clock in the morning all hands had been transferred to the warships.

"The destroyers, with all survivors on board, remained on the scene until four a. m., hoping to pick up others, and then we proceeded to the French coast. At six o'clock we passed a great mass of wreckage of the *President Lincoln*—chests, furniture and so on.

"*Divided Food and 'Smokes.'*—The men on the destroyer were certainly fine. They divided all their clothes, smokes and food with us survivors and were a hospitable lot all the way through.

"I might add that there were 42 men in my boat, where I had the stroke oar. We started from the ship with about 18 and picked up the others

from the water or from overcrowded boats or rafts. When we gathered, after the U-boat left, we lashed many of our boats and rafts together, which was possible because of the fine weather.

"Under the cool direction of our officers we took men from rafts and placed them in lifeboats, according to their physical condition, the strong, younger men being placed on the rafts, where the exposure was more severe than in the boats. This will prove to Americans the fine order and discipline that were maintained throughout our trying experience.

"Just as the *Lincoln* went down we gave three big cheers, just to give the old girl a fitting send-off and make her feel a bit easier as she lies on the bottom of the Atlantic."—*N. Y. Herald*, 17/6.

BATTLESHIP, MISTAKEN FOR TARGET, STRUCK BY SHELL.—The Navy Department authorizes the following statement:

The commander-in-chief of the Atlantic fleet has reported to the Navy Department that on June 1, while certain vessels of the fleet were holding target practice, one ship, due to the bad visibility, mistook another ship for the target, with the result that the U. S. S. *Louisiana* was struck by a shell and Moses L. Morgan, fireman, third class, was killed.

The commander-in-chief is having the accident thoroughly investigated and report will be forwarded to the department as soon as it is completed.—*Official Bulletin*, 5/6.

HOSPITAL SHIP GOING ABROAD.—The U. S. S. *Comfort* has been selected to serve as an ambulance ship between this country and the American naval base aboard. Press dispatches of June 2 reported that in spite of German attacks on allied hospital ships, it was planned to send the *Comfort* across without convoy, notifying the German Government of her intended voyage and its purpose. All the distinguishing marks prescribed by the Geneva Convention for vessels of that character were to be carried, it was stated. The fact appears to be that the question of how and when the ship will sail is as yet undetermined. The *Comfort* will be the first American hospital ship to enter the war zone, Vice Admiral Sims's forces having depended upon returning transports.—*Army and Navy Journal*, 5/6.

GERMAN SUBMARINES OFF AMERICAN COAST.—German submarines have at last brought the war to our own doors by attacking and sinking harmless freight and passenger steamers and coastwise sailing ships at various points on the Atlantic coast between Cape Cod, Mass., and Cape Hatteras, N. C., and considerable loss of life has resulted. The submarines have been operating in their raids from as early as May 25, but the fact of their presence did not become publicly known until June 2, when an S. O. S. wireless call was received from the passenger steamer *Carolina* that she was being shelled by a U-boat.

While the exact number of vessels sent to the bottom may never be known, 12 vessels it is certain had been destroyed up to June 6 and three vessels attacked were saved. One steamer, the oil tanker *Herbert L. Pratt*, of 5372 tons, which was partially sunk four miles off Cape Henlopen, was saved and taken safely to port. Her captain is not sure whether she was torpedoed or struck a mine laid by the enemy. It seems likely that she was mined. Two schooners, which were also bombed, were later saved. Of the other vessels sunk five were steamers and seven were wooden schooners ranging from 325 to 1791 tons. None of the craft sent to the bottom were of any military value. The sinking of the passenger steamer *Carolina*, well out to sea off the New Jersey coast, resulted in loss of life after the passengers and crew had taken to the boats. One boat was swamped and capsized in a storm, and a number of persons in her are known to have been drowned. Thirty persons in all were unaccounted for up to June 7. The small boats became separated in the night and some were picked up by incoming ships, while one boat reached port herself. The

vessels were destroyed in most cases by bombs being placed on board, and shellfire was used in sinking others. The torpedoes were evidently saved by the submarines for more valuable prey. The last victim up to the time we went to press was the British steamer *Harpathian*, sunk 100 miles off the Virginia Capes by a torpedo.

The Navy Department took prompt action in endeavoring to locate the submarines and protect shipping, and all suitable war craft were out combing the seas for the enemy's boats the moment their presence became known. Numerous aircraft also traveled over the waters trying to locate the submarines. So effectively was the navy scouting work accomplished that one United States destroyer located a submarine while she was attacking the French steamer *Radioleine* on June 4, some 65 miles off the Maryland coast. She saved the steamer and pursued the submarine, which managed to submerge and get away. The destroyer also rescued two men from a small American schooner that had been bombed by the submarine. Our patrol force will certainly make it warm for the submarine off the coast, and it is hoped that some of them speedily may be sent to the bottom. The U-boat attacks will have no effect in stopping the flow of troop and supply transports across the ocean, nor will the attacks weaken the convoy of troop ships.

In addition to sinking ships the Germans have planted mines off some of our ports. Mine sweepers picked up a number of mines off the Atlantic coast, the Navy Department announced on June 5. "The mines were of German manufacture and undoubtedly were strewn by German submarines," says the Navy Department statement.

How many German submarines have been operating in American waters it is impossible to say, but it seems certain that there are a group of them of very large size. This is borne out by the discovery of German mines off our coast, indicating that there must be mine carrying submarines or an auxiliary steamer in addition to those making attacks on ships.

Contrary to their usual custom, the Germans treated the crews of the sunken ships humanely so far as has been learned, very probably in the hope of influencing American public opinion to have us forget the brutal atrocities their submarine crews have committed on American and other non-combatants at sea in the past. To sink a passenger steamer far out to sea near nightfall, however, as was done by a submarine in the case of the *Carolina* on June 2, leaving women and children and other passengers to battle against fate on the high seas in small boats can hardly be regarded as a humane act. The Germans did, however, refrain in this instance from shelling the helpless survivors in the boats, or deliberately drowning them as they have done in numerous cases in European waters.

A 2400-ton U-boat, which it is understood is a type the Germans have constructed, has a cruising radius estimated at approximately 8000 miles. Some of the newer types of this craft have operated in the vicinity of the Azores, and bombarded Monrovia, the capital of Liberia, on the coast of Africa, on April 10 last. It seems not unlikely that there may be one or more special submarines with the group on our coast carrying supplies. The stories of survivors of the submarine raids, when pieced together, indicate that the attacking boats are of unusual size. Since the visit of the German war submarine and the commercial submarines to American shores in 1916, where against the protests of both the British and French governments they were allowed the freedom of Baltimore, New London and Newport, the Germans have surely made improvements. That they would attempt sinkings and mine planting off our coasts has been a foregone conclusion, and the raid is not surprising in the least. Our principal ports were mined and netted early in the war to safeguard them against submarines and other enemy war craft.

Captains and members of the crews of two steamships sunk off the American coast on May 25 have told the most interesting stories of a large submarine to which they fell victims and of their experience while held

prisoners on board the raider during the eight days' operations. Capt. C. M. Gilmore, of Port Clyde, Me., master of the *Edna*, told the authorities that the U-boat commander had stated to him that he intends to continue his raid in American waters for 30 days. Captain Gilmore also stated that the submarine on which he was a prisoner sent and received wireless messages and listened to press bulletins about the war, probably sent out from America. He stated that the submarine was at least 300 feet in length and carried a crew of 76 men, that she mounted two 6-inch guns, one forward and the other aft. Captain Gilmore also stated that according to marks in the interior of the submarine she was the *U-151*. He, and also other prisoners, said that they were all well treated aboard the submarine, and that her captain spoke perfect English. Captain Gilmore was told by the commander that the submarine could submerge in 45 seconds. It was also said that she carried supplies for at least a month for operations on the American coast. Another survivor declared he was told that the submarine carried supplies for six months, but this latter is presumably a German exaggeration. According to some of the sailors held captive on the submarine there are a number of Germans aboard who have served in the American Navy, and who consequently have a valuable knowledge of our coast. One German is said to have served in the U. S. Navy with the rank of boatswain.—*Army and Navy Journal*, 8/6.

U-BOATS REDUCED TO WAR ON OUR COASTING SMACKS.—Two confessions of failure are seen by our press in the raid of several large U-boat "cruisers" on the helpless little schooners that ply up and down the Atlantic coast. "Those U-boats wouldn't be fussing around with schooners if they could get a transport," remarks an astute writer in the New York *Evening Sun;* and another in *The Wall Street Journal* observes sagaciously that the submarines "are here because the U-boat campaign in European waters has completely failed to interrupt the flow of American troops and supplies to France." Indeed, one of the U-boat captains let fall the information to one of his captives that the submarines had been here two months, and had been told to produce results or return home. Hence evidently the outburst of destruction against the small fry of our Eastern waters. Only one large steamer was bagged. What was the object of this dispatch of a U-boat squadron across three thousand miles of ocean to almost certain destruction? To dismay and terrorize the American people as preparation for a German peace drive, to impress Mexico and stimulate pro-German propaganda there, to check the rush of American troops and munitions to the battle-front, to force the recall of American destroyers from European waters for home defense, and to bolster up the declining confidence of the German people in their Government's U-boat policy—these are some of the purposes American observers detect. Captain Gilmore, who spent eight days as a prisoner on one of these far-ranging submarines after it had sunk his schooner *Edna* off the Maryland coast on May 25, describes this undersea raider as 300 feet long, with a crew of 76 men, two 6-inch guns, and the ability to submerge in 45 seconds. From May 25 to June 4, the recorded toll of this and other U-boats operating from the Virginia Capes to the New Jersey coast mounted to more than a dozen ships, mostly small schooners, but including the passenger steamer *Carolina*, whose crew and passengers, about 350 in all, were turned adrift in open boats a hundred miles from land, with the result that many perished in a storm.

But whatever the motives and expectations behind Germany's audacious extension of her submarine warfare to a zone three thousand miles from the home bases, the reaction in this country is not likely to afford her much comfort. It is true that the ports of New York and Boston were closed for a few hours when the presence of U-boats off our coast was first officially established, and that New York City dimmed its lights as a precaution against bombing airplanes which might have arrived by the undersea route. New Yorkers were even instructed by the police department that

when the sirens and whistles announced such an air raid they should "immediately open the windows of their homes or offices and go at once to the cellar of the premises." But these precautions, our papers make clear, were not prompted by any spirit of panic. Our psychological reaction is more truly revealed in the fact that the day after the arrival of the U-boats became known naval recruiting in New York surpassed all records since the United States entered the war. And on the same day New York made its first systematic effort to round up unregistered enemy aliens. This patriotic reaction is recognized and reflected in an appeal by German-Americans to "all Americans of German birth" to hold a tremendous demonstration "which will show our fellow citizens that in this hour of danger there is but one single great united people." This appeal, as published in the *New-Yorker Staats-Zeitung* and the *New-Yorker Herold*, says in part:

"While hitherto the theater of war has been three thousand miles away, it has now been brought tangibly near to us. It is, therefore, not to be wondered at if a powerful, deep emotion has gripped the American people—an emotion which is certain to manifest itself in a flaming-up of patriotism and in an even firmer and even more unreserved support of the government than that which has already existed.

"Americans of German birth have been equally placed in a state of the highest excitement by the appearance of the U-boats. In this hour, when the danger has come nearer, they feel themselves more than ever one with the whole American people. More than ever before do they realize that it is the new home to which belong their first and last thoughts; that it is the new home to which they are devoted and which they must help to protect and defend. . . . .

"Now is the time to show clearly and convincingly how gravely those erred who believed that the loyalty of Americans of German birth could be doubted!"

Thus the U-boat visitors, as the Boston *News Bureau* remarks, "add the finishing touch to a process already well accelerated—the war-waking of America." "The closer the war comes to us," affirms the Brooklyn *Eagle*, "the more firmly shall we resolve to make an end to the German military power, and in that resolve we shall never weaken." The New York *Tribune* welcomes the raiders as an added incentive to American achievement, and the New York *Evening Post*, noting the entire absence of flurry or panic on the part of press and public, remarks that the news "simply left most people saying: 'Well, they are here at last.'"

If Germany hoped to cause the recall of some of our destroyers she is doomed to disappointment. Secretary of the Navy Daniels assures Congress and the country that we have enough ships on this side to deal with the situation without any interruption of our present naval program. While the U-boats have demonstrated the possibility of a long-distance campaign against our coastwise trade and of sniping operations against unprotected seaboard towns and cities, remarks one military expert, "they have not accomplished anything worth while in a military sense; they have not disclosed any ability to sink troop ships or to break through our convoy system." The only change they have caused, it seems, is that we now convoy our troop ships all the way across instead of having our warships meet them in mid-Atlantic.

It is not surprising, notes the New York *Times*, that after we have been at war with Germany for nearly 14 months we should find the U-boats at our ports. We were prepared for this by the visits of the *Deutschland* and by the raid of the *U-53* against allied shipping off Nantucket in October, 1916. Nor were these our only warnings, says *The Times:*

"In September last Copenhagen reported that Germany was fitting out U-boats of 1500 tons and 340 feet long, with hull space for 'forty torpedoes and a large number of shells and mines.' Moreover, she was building submersibles, larger than the *Deutschland*, which could carry oil and be used as tender or mother ships. The Spaniards, who may claim a more intimate

acquaintance with visiting German submarines than other neutrals, have even declared that 'the latest large German undersea boats are so well equipped that they are able to go around the world without having to replenish the fuel supply for their motors.' This strains credulity, but there is a reason to believe that in order to operate on the American Atlantic coast it is not necessary for the enemy to have a base in the West Indies or on the Spanish Main. Sir John Jellicoe was quoted about a year ago as saying that the Germans could not undertake a submarine campaign in our waters without establishing such a base. Probably he would no longer adhere to that view. A British nautical periodical recently heard of a flotilla of six German submarine cruisers of 2800 tons' displacement, which were to carry 6-inch guns and to have the protection of an armored conning-tower. These dreadnaught U-boats were to be ready for business this spring."

Disease germs may form part of the cargo of the raiding U-boats, Washington correspondents tell us. Thus one dispatch quotes several naval officers as saying that survivors of the U-boat attacks should refrain from giving away as souvenirs any of the food or other articles given them by the U-boat commanders. It goes on to say:

"While not desiring to cause undue alarm, it was officially pointed out that a German submarine carried disease germs into Spain, apparently those which caused the strange epidemic similar to the grip, now raging there. This fact, coupled with the strange conduct of German commanders toward U-boat victims, was regarded as suspicious.

"'German commanders don't do things that way,' said one official to-day. 'It is unparalleled in German submarine history that a U-boat should give food and water to its victims.'"

It was a German U-boat commander who murdered the women and children of the *Lusitania*, the New York *Tribune* reminds us. And "to force women and children into an open boat and leave them to their fate at sea is still murder, an atrocity unimaginable until Germany began her her frightfulness at sea."

There is "a Mexican end" to the strategy of the Atlantic coast submarine attacks, according to some observers. Thus passengers on an American steamship which recently reached New York from Mexico report that U-boats have been carrying messages between that country and Germany. And in a Washington dispatch we read:

"Two objects are supposed to tempt German operations in Mexico. The most immediate, and most closely identified with the new submarine venture on Atlantic coast shipping, is the attempt to shut off all crude-oil shipping for the British Navy from Tampico. The second is the effort to use Mexico, not merely to embarrass the United States in its war against Germany, but actually as a starting-point for major operations against the United States in case the turn of European events would make it possible.

"Germany wants a Pacific naval base, and wants to retain her South-American interests. Both might be accomplished under proper conditions through Mexico."

U. S. "SUB" ENCOUNTERS U-BOAT OFF COAST?—A German submarine and its entire crew was destroyed by an American submersible off the Virginia coast about June 15, according to a report brought here to-day by passengers aboard an American steamship.

Officers of the vessel claimed to have been told the story of the submarine combat by members of the victorious American undersea boat's crew.

The American liner had put into the mouth of the Chesapeake Bay for shelter, in response to submarine warnings, and there anchored near an American submarine tender, alongside which was moored the undersea craft, which was taking on provisions and fuel, officers of the vessel stated. An interchange of wireless messages followed, in which the submarine crew is reported to have told of its victory.

Oil Seen After Shot.—The U-boat was sighted while the American craft was patrolling with only her periscope visible, according to the story the American skipper is alleged to have told. When within range a torpedo was released and 20 seconds later microphones recorded a terrific explosion, he was quoted as saying. Rising to the surface the American submarine circled about on the lookout for survivors, but oil coming to the surface was the only trace found of the vanquished raider, narrators of the story said they had been told.

Navy Department Uninformed.—No word has reached the Navy Department to-day of the destruction of an enemy U-boat by an American submarine, as reported by passengers arriving on a steamer at an Atlantic port. Constant firing of patrol boats and armed merchantmen at any suspicious object on the water has given rise to many such reports during the last three weeks.—*Washington Evening Star,* 18/6.

U-BOAT CAPTAIN ONCE GUNNER IN AMERICAN NAVY.—The first definite description of the raiding German submarine *U-151* was brought to an American port yesterday with the arrival of an American steamship from Cuba. The facts in the report were vouched for by 19 men comprising parts of the crews of the *Hattie Dunn* and the *Edna,* schooners, and the auxiliary schooner *Happauge,* all of which vessels were sunk by bombs.

It was established that the commander of the submarine is Captain Neustidt, who, during the time he held the seamen prisoners, told them that for five years before the war began he was a gunner's mate in the American Navy. He was friendly to the prisoners, they stated, and told them that he had no desire to sink American vessels, but had been informed by wireless on May 19 to begin his activities along the United States coast. At that time he was at the Azores.

The *U-151* left Kiel April 14 last, and up to June 2 had sunk 15 vessels, of which six were American, the German commander said. He explained that he and his officers and crew had been hard put for food until the sinking of the schooner *Isabelle B. Wiley,* at which time they had obtained good food and plenty of it.

The prisoners said that they were put to work polishing 18 torpedoes on the raider and that the commander explained that bombs were good enough for coastwise vessels, but that the torpedoes were being held for use against United States army transports.

According to the men the *U-151* is 210 feet in length, 29 feet beam, and her shell is made of three-quarter inch steel. She carries two 5.9-inch guns on the deck fore and aft, four stationary rapid-fire guns on deck and below decks 100 racked rifles of the rapid-fire type for boarding purposes. She has two periscopes, one over the conning-tower and the other aft.

On the way portward the steamship which picked up the men of the three crews made two calls at Atlantic ports to ascertain what she had best do to avoid attack. For four days she was accompanied by destroyers and seaplanes, and on Monday last reported seeing four American destroyers going south along the Florida coast at top speed. Two hours later she received a report that submarines were active in the vicinity.

The report that the steamship *Keemun* had arrived safely at an Atlantic port was received by naval authorities yesterday after two vessels arriving from coastwise lanes had reported the British vessel's call for aid and indicated that she had been destroyed.—*N. Y. Herald,* 15/6.

VIENNA SAYS U-BOATS HERE ARE ARMORED.—*Described as Having a Tonnage of 3000 and a Speed of 12 or More Knots.*—According to a Zurich telegram to the *Temps* to-night, it is stated by the *Neue Freie Presse* of Vienna that the German submarines now operating off the American coast are of the type known as armored submarines. They have a tonnage of from 2500 to 3000, and a speed of between 12 and 15 knots.

These boats take, it is stated, 20 days to cross the Atlantic, and carry provisions for two months.—*N. Y. Times,* 9/6.

13 MORE SUPPOSED LOST WITH "CYCLOPS."—An additional list of 13 men, probably lost with the naval collier *Cyclops* has been received by the Navy Department. The announcement said they had been transferred from other ships to the *Cyclops* as passengers and were presumably aboard the vessel when she left on her last voyage.—*N. Y. Herald,* 23/5.

ARMED GUARDS OF THREE SHIPS ARE PRAISED FOR BRAVERY UNDER SUBMARINE ATTACKS.—Secretary Daniels has commended the following men for the manner in which the armed guards under their command acquitted themselves when the vessels on which they were serving encountered German submarines:

Dow Ripley, chief boatswain's mate, United States Navy, in charge of the armed guard on board the steamship *El Occidente* when that vessel was attacked by German submarines on February 7, 1918. The coolness of the crew and the accuracy of the shooting of the armed guard resulted in the escape of the *El Occidente* and apparent serious damage to the submarines.

John Weber, chief boatswain's mate, United States Navy, in charge of the armed guard on board the steamship *Santa Maria* when that ship was torpedoed by a submarine on February 25, 1918. The gun crew under his command remained on board and at their guns until the vessel had sunk so far that the water was coming up around the forward gun.

Joseph E. Reiter, chief gunner's mate, United States Navy, in charge of the armed guard on board the steamship *Paulsboro* when that vessel was attacked by a German submarine. Eighty rounds were exchanged, and notwithstanding the enemy was using shrapnel, and shells were bursting in the vicinity of the gun crew, they unflinchingly held their posts, and through their cool and efficient behavior succeeded in saving their own ship and driving off the submarine.

Chief Boatswain's Mate Ripley in his report describes the fight the *El Occidente* had with the two submarines:

"At 12.15 p. m. on February 2 the feather of a periscope was observed bearing on the port beam, steering almost the same course as the *El Occidente.* When first sighted only the tip of the periscope was exposed between the seas. There was a moderate sea with white caps at the time. All hands were called to quarters, and the guns were trained, with orders to fire as soon as the periscope was picked up. Suddenly about 6 or 8 feet of two periscopes emerged from the water and firing was commenced. The first shot from each gun hit about 10 feet from the periscope. Firing was continued, the ship's course changed, and the shell fell right on top of this submarine, which submerged.

"The submarine then appeared dead astern, headed slightly toward the vessel, and fired a torpedo, which passed about 600 feet across the starboard quarter.

"At that time one gun's crew reported another periscope, this time on the starboard beam, but before a shot could be fired the course of the ship was changed, bringing the periscope astern and between the steamship and the sun. The first submarine then appeared on the port side, a little abaft the beam, and the port guns opened fire, the shots from both guns hitting in the feather of the periscope. This submarine disappeared in the smoke from the ship, but firing was continued.

"The submarine came with a rush and looked as if she was going to come up, but as the shots were hitting on top of her, she suddenly disappeared," Ripley says in his report. "When last seen," he adds, "the submarine acted as if in distress, and, in the opinion of the armed-guard commander, some of the shots damaged her, as the enemy craft acted as if it was endeavoring to come to the surface.

"All possible assistance was given by the junior officers and merchant crew. The armed-guard commander has never seen guns handled in a more cool and skillful manner. It is believed that the submarine was about to fire a torpedo when the *El Occidente* opened fire, and that the coolness and excellent shooting of the gun crews and promptness of the merchant

crew in carrying out orders confused the submarine and caused it to fire wild."

The *Santa Maria* was struck on February 25 by a torpedo, which passed under one of the vessels convoying her and hit the ship in a tank, causing oil to explode. The captain signaled full speed ahead with a view to beaching the vessel, which was not far from land, but the engines would not work. As the ship was sinking fast by the bow, the captain gave the order to abandon ship. The merchant crew took to their boats and the gun crews stood by their guns, awaiting word from their commander to leave their stations. The gun crews stood by until the forward part of the ship was well under water, when they were told to man their boat.

The gun crews had lowered their boat to the rail when one of the convoying ships hailed and said she would come alongside and pick them up. They had hardly gotten safely aboard this vessel when the *Santa Maria* keeled to starboard and sank.

Speaking in behalf of the gun crews, Boatswain's Mate Weber says that not one of them was excited or confused and that all stood by their stations until the last minute.—*Our Navy.*

U-BOATS GOT FEW SHIPS.—*Two New Cruisers Sank Only 29,000 Tons on Long Voyage.*—The new type of German submarine cruisers accomplishes little, according to an official note commenting on German undersea boats. Exact information relative to the operations of two of these boats which left Germany at the end of 1917, cruised as far as the equator, and were absent for four months shows that they accounted for only 29,000 tons of shipping.

This was equal to only one day's total loss from submarines in April of the same year. At this rate Germany would require 60 submarine cruisers at sea simultaneously to inflict the same loss as that visited upon shipping by submarines in European waters in a month.

"But Germany cannot maintain more than 20 of these boats," says the official note, "since the Allies destroy submarines faster than they are built. However, if they sink few ships the submarines operating in European and American waters are useful because their cargo space enables them to bring back to Germany valuable materials which are totally lacking there."—*N. Y. Times,* 9/6.

NORTH SEA AND CHANNEL

LOSS OF THE "AMAZON."—Details have now been received of the loss of the Royal Mail liner *Amazon,* which was torpedoed on March 30 last, while bound from Lisbon for Liverpool. Although the steamer was being escorted by two British destroyers, two German submarines managed to approach on either side of her, and to launch torpedoes against her almost simultaneously. Struck by both the projectiles, the *Amazon* broke in two and sank in a few minutes. The escorting destroyers immediately opened fire on the U-boats, and, thanks to the accuracy of their fire, succeeded in sending both of them to the bottom. Then the destroyers turned their attention to the rescuing the crew and passengers of the doomed liner, all of whom were saved and safely lander in England. Seven of the crew of one, and four of the crew of the other submarine were likewise saved.—*Nautical Gazette,* 1/6.

AERIAL OPERATIONS ON FLANDERS COAST.—During the period April 29-May 5, inclusive, air force contingents working from Dunkirk carried out bombing operations against Ostend, Westende, Zeebrugge Mole, lock gates, seaplane base, and enemy shipping in the vicinity. Direct hits were obtained on the mole and seaplane base and on the docks at Zeebrugge. One of our machines failed to return. In the course of offensive patrols one enemy two-seater machine was destroyed and another driven down out of control.—*United Service Gazette,* 16/5.

MINE SWEEP TORPEDOED.—The British Admiralty announces that a British mine sweeping sloop was torpedoed and sunk by a German submarine on May 6. Two officers and 13 men are missing and are presumed to have been drowned.—*Army and Navy Journal,* 18/5.

"UC-39" FIRES 25 SHOTS AT VESSEL AFTER SURRENDER, BUT IS LATER SUNK.—With the passing of the third anniversary of the sinking of the *Lusitania* one is reminded that for more than three years—if reminder be necessary of the time—the U-boat commander has continued his ruthless slaughter of innocent seamen, apparently unperturbed by that greatest of sea atrocities effectively laid to the charge of the German Navy.

To the long list of sea crimes of this character which have been revealed is now to be added another, details of which come from a reliable Dutch source. It is the case of the Norwegian steamship *Ida;* which, notwithstanding the fact that she stopped immediately the signal "Heave to" was given by the German submarine, was fired on 25 times, and the mate and steward were killed while in the act of lowering the *Ida's* boats.

According to the correspondent, the boat which carried out the attack was the *UC-39,* a new mine-laying submarine, commanded by Otto Ehrentraut, a personal friend of Prince Henry of Prussia and a frequent visitor to the castle at Kiel, where he was a favorite.

Opens Fire on the Ida.—It seems the *UC-39* left her base about midnight and next morning sighted the *Ida* and opened fire on her. The *Ida* stopped immediately, probably after the first round, but nevertheless the submarine continued firing under the personal orders of Otto Ehrentraut. When the gun-layer saw that the ship had stopped and that he had obtained several hits he asked if he should cease firing. He was told by the captain to carry on. Some 25 rounds in all were fired, the last few being at a range of 3000 meters. When the German finally ceased fire one of the *Ida's* boats went alongside the submarine and reported that two wounded had been left on board the steamship.

The sub-lieutenant and three men were sent on board her and found the mate and a steward dead on the deck, having been killed while in the act of lowering the boats. The *Ida* was then sunk by bombs. The two dead bodies had been left lying on the deck, with less regard than is usually paid to the corpse of a dog.

Two hours later the *UC-39* opened fire on a steamship and a trawler, but on diving lost them in the mist. About one o'clock she came to the surface and opened fire on another steamship, but her fire was almost immediately answered from a British destroyer.

Shattered by a Depth Charge.—The *UC-39* had evidently met a sterner order of things than defenceless merchantmen and dived, but not soon enough, for a depth charge shook her vitally, so that water poured into her conning-tower and control room, causing a panic among the crew. The *UC-39* rose sharply to the surface, only to have the destroyer rake her fore and fat. Ehrentraut climbed out of the conning-tower hatch and was preparing to surrender when he was killed by a shell.

The engineer and sub-lieutenant were the next on deck and the former was immediately wounded. The *UC-39* was still making speed on the surface and the destroyer therefore continued to fire. Three of the crew jumped overboard and were drowned, while three others on the deck were killed by gun-fire and several were wounded.

Finally the destroyer hailed the *UC-39* through a megaphone to stop, and, this being done, fire ceased and 17 German survivors were taken off by the destroyer. Two British prisoners were also rescued uninjured.

In addition to giving details of the attacks of the *UC-39* and her destruction by the British destroyer, the Dutch correspondent states that he has been able to ascertain that among the U-boat men there is not at all a sanguine feeling regarding the results of the German "blockade." The men who do the actual work are not imbued with the confidence of Von

Tirpitz, and they also express contempt for the views of the German press on the efficacy of the U-boat weapon against Great Britain.

Crews Know Force Opposing Them.—Some of the crews, in the course of their depredations, have been able to get British newspapers showing the shipping output of the Allies, and in addition they know the strength of the hunting forces against them, and, what the German public does not know, the number of U-boats which never return.

The correspondent adds that he recently saw a letter from a German soldier to the effect that even if a thousand submarines were available England would not be defeated, from which it would appear that the knowledge of the limitation of the U-boats is not confined to the German Navy.—*N. Y. Herald*, 2/6.

BRITISH DESTROYERS LOST.—The British Admiralty reports that six officers and 13 men are missing as the result of the torpedoing of the sloop *Cowslip* and the foundering of torpedo-boat *No. 90*, both on April 25, 1918.—*Literary Digest*, 18/5.

U-BOAT SINKS BRITISH DESTROYER.—One of the British destroyers was torpedoed and sunk by an enemy submarine on May 14. Two men were killed.—*N. Y. Herald*, 19/5.

U-BOATS TORPEDO FISHING BOATS IN NORWAY'S WATERS.—German submarines again have started unrestricted warfare on Norwegian fishing boats in the Arctic Ocean north and east of the Norwegian coast. Fishermen, saved from sunken vessels and landed at Hammerfest, report that the commander of a U-boat stated that all vessels met by him would be sunk. Norwegian ships especially would be destroyed because, he said, the Norwegians were sending fish oil and seal oil to England. This, however, is contrary to the truth, as the export of oils is forbidden, and Germany knows it.

The U-boats are said to shell vessels without warning and, according to the survivors, direct a fire against life-boats.

Russian fishing boats and a Russian mail steamship from Vardoe, eastward bound, and overcrowded with passengers, also were shelled. Eight persons, among them a postmaster and his assistant, were killed on the deck of the steamship. Many others were hurt after taking to the boats.

When the commander of one German submarine was advised that Russia was at peace with Germany he answered that he acted the way it suited him. The U-boat measured 180 feet in length. Shipping authorities are surprised that it can carry enough oil for a cruise so far up the Norwegian coast.

Great bitterness has been caused among the Norwegian population by the action of the submarines, as Germany gets a large part of the fish caught around these places. The newspapers suggest that fishermen stop selling their catch to Germany.—*N. Y. Herald*, 21/5.

"MOLDAVIA" TORPEDOED.—The Peninsular and Oriental liner *Moldavia* was torpedoed and sunk by a German submarine on the morning of May 23, with a loss of 53 lives. All the victims were American soldiers, two of them being non-commissioned officers and the rest privates. The *Moldavia* was carrying 480 American soldiers belonging to the Fifty-Eighth United States Infantry, Fourth Division, and was moving forward steadily on a smooth sea and was almost in sight of its destination when the torpedo crashed into the boat's side. The vessel listed sharply. Destroyers began rushing alongside and fore and aft in an endeavor to find a trace of the submarine. Although they prevented the U-boat from reappearing, it is not known whether a hit was scored by the depth charges which were dropped in a circle around the point from which the torpedo was sent.

The *Moldavia* was off the southeast coast of England when attacked. All the soldiers lost were members of Company B. The *Moldavia* was of

9500 tons gross, and was built in Greenock in 1903. She was 520 feet long, and was a sister ship of the *Mongolia*, lost off Bombay in July of last year.—*Nautical Gazette*, 1/6.

FISHING VESSELS ARE SUNK.—Twelve of the fleet of 30 or 40 fishing vessels which left Irish ports on the night of May 30 were sunk by a German submarine. The submarine suddenly appeared in the midst of the fleet and ordered the fishermen to take to the boats and row ashore. It then sank the vessels by shelling them.

The fishermen say that the submarine was interrupted in its work and submerged, which probably prevented destruction of the entire fleet. The fishermen lost all their gear but there were no casualties.—*Evening Star*, 3/6.

ZEEBRUGGE MAGAZINE BELIEVED BLOWN UP.—A long, heavy aerial bombardment was made on Zeebrugge Thursday night, and at about 1 o'clock this morning there was a tremendous crash.

Flames arose high in the air, and it is supposed that a powder magazine was exploded, according to a Flushing dispatch to the *Telegraaf*.—*Evening Star*, 1/6.

A Zeppelin airship was shot down on June 1 off the Jutland coast, it is reported, by a British torpedo-boat destroyer. The crew of the airship was drowned.—*Army and Navy Journal*, 8/6.

AMERICAN ENSIGN INTERNED BY DUTCH.—An American naval officer, Ensign Eaton of Connecticut, has been interned. He was among other officers who descended on Dutch territorial waters during a recent seaplane flight off Terschelling. He was unhurt, but his machine was damaged.

Ensign Eaton's parents live in Massachusetts.

Ensign Eaton was the senior pilot on a machine which had been detailed to protect from attack an airplane which had descended on the sea for repairs. The latter machine was commanded by Robert Paul of Buffalo, who is in the Canadian flying corps.—*Evening Star*, 8/6.

BRITISH AIRCRAFT DESTROYS THREE ENEMY SUBMARINES.—Accounts of the destruction of three enemy submarines by British aircraft were published yesterday. It is explained that the longer hours of daylight enable seaplanes, airships and the kite balloons to assist materially in finding U-boats. Summer conditions favor the submarine searchers, whose incessant patrolling of the seas forces German craft to seek deeper waters.

An observer in a British towing balloon sighted certain things which, to his trained eye, indicated the presence of a U-boat at a great depth. Depth charges were dropped and the submarine was obliged to shift its position. The balloon continued on watch and an hour later a submarine was observed to emerge a long distance away on the horizon and begin shelling a sailing vessel. The balloon was towed rapidly to the spot and in the meantime the U-boat was forced to submerge by shots from the towing vessel. Under the direction of the balloon observer the towing vessel got over the track of the U-boat and dropped nine depth charges. A large quantity of oil came to the surface, spreading gradually until it covered an area of a square mile.

A British dirigible sighted a U-boat attacking a merchantman. The dirigible reached the spot just after the U-boat submerged and dropped a bomb three feet astern. A quantity of oil came to the surface. The dirigible dropped a second bomb, scoring a direct hit and lifting the submarine to the surface momentarily, after which it disappeared in a pool of oil.

A seaplane sighted a U-boat submerging and dropped a bomb which brought a quantity of air bubbles to the surface. The seaplane dropped a

second bomb into the center of the churned water and a great quantity of oil came to the surface. The disturbance continued for so long a time it was evident the submarine was mortally wounded.—*N. Y. Herald*, 10/6.

AMERICAN FLIERS AID IN "SPOTTING" SUBS.—While there are no American seaplanes here yet, American aviators are doing fine work in "spotting" and bombing U-boats, and their records are carefully enshrined in "American territory" in London.

Here is one "incident" which may be related:

A submarine commander on patrol duty enters in his diary: "There was apparently some excitement at the eastern end of our billet. About eight o'clock we heard a few bombs to the eastward, rather loud, and thought that gun-fire was also distinguishable. Fearing that our periscope might hamper the movements of our friends, changed course to west. A destroyer approached rapidly, and our course was changed to the westward, then southward, keeping astern. We had no idea that we had been sighted, and as soon as I distinguished her as a destroyer, we went down very quickly. She was heading straight for us, and her gray color was a perfect disguise against the horizon.

"On the whole," adds the commander after recounting certain other adventures which cannot be told in detail, "it was quite an exciting Sunday."

As that day of rest had included the trailing of a couple of drifters, and a second destroyer, and the dodging of various undiscoverable enemies, it may be agreed that the submarine commander did not exaggerate.

Commended by British.—Two recent attacks upon German submarines by Americans piloting British machines have won official commendation. One mention of valuable services rendered has been made by the British Admiralty; the other by the admiral commanding the station from which the operation took place.

"On Monday I left for patrol in British seaplane No. —," reports an ensign in the Naval Reserve attached to the Aviation Service, "with a British observer. Half an hour later I sighted the periscope of a submarine directly ahead of me. Immediately I opened the engine full out and attacked, dropping a bomb, which landed a few feet ahead of the periscope and directly in line with it. After a moment great quantities of air bubbles came to the surface. The water all about began to boil. I turned and attacked again. This time I dropped a bomb of twice the size. It landed nearly in the center of the first disturbance. A mass of oil now appeared on the surface, in addition to the debris left by the bomb itself. The second disturbance continued for some time. Then I circled round for two hours before returning to base, warning merchant ships in the vicinity and informing a destroyer which was escorting a British submarine of what I had seen and done."

The British Admiralty, in forwarding this report to Admiral Sims, states that it is believed the submarine was "damaged," and expresses its appreciation of the American officer's action.

Submarine bombing, however, is not always a matter of skill. Sometimes luck turns the balance of success, and the result is exasperating, as the following instance shows:

"On March —, while flying from a British station in Seaplane No. —, with a British observer," writes another American airman, of the Naval Reserve, "we sighted an enemy submarine of a very large type, fully blown, on the surface. On overtaking her I dropped two bombs, one of which fell 10 feet astern of the submarine, the other the same distance ahead of her. Turning again, I let loose a third bomb. This one landed directly on the back of the submarine, but unfortunately failed to explode. The submarine dived immediately."

The British officer commanding the base characterized this attack as "executed in a masterly manner."

So much for the activities of American airmen in sea operations. There was another lieutenant in the United States Navy attached to a British bombing squadron in the Dunkirk area, after flying service in Italian waters. He repeatedly penetrated the air barrage over enemy airdromes in Flanders, and took part in a bombing exploit during the great battle beginning March 21. During one of the raids over Zeebrugge his machine was repeatedly hit, and part of the rudder and one of the wings were shot away. He several times drove away enemy airplanes which attacked him at close quarters.—*N. Y. Herald,* 19/5.

THIRTY-TWO GERMANS LOSE FIGHT FOR LIFE IN SUNKEN U-BOAT.—Harrowing details of the destruction of one of the largest and more recently constructed German submarines are given in a despatch from a neutral correspondent. This submarine was one of the last to leave Zeebrugge before the entrance to the harbor was blocked by British forces on April 24.

The U-boat struck a mine, and out of the crew of 40 only two survived on struggle with death for more than an hour, 20 fathoms below the surface. Some of the crew committed suicide, having lost all hope of leaving the boat alive.

The only chance of escaping was to force open the conning-tower and the forward hatches and trust to the compression of air in one part of the vessel to force each man like a torpedo to the surface. The air pressure in the submarine had become so high that the great majority of the Germans could not keep their mouths closed.

The compressed air shot them to the surface, and hardly had they reached the sea level when the air pressure burst their lungs and about 20 of them sank like stones. The survivors described the yells of the men, when the end came, as the most horrible noise they had ever heard.

The attention of a British trawler was attracted and it hastened to the rescue. The condition of the survivors showed that their experiences in the submarine had been of a dreadful character.—*N. Y. Herald,* 18/6.

BRITISH VESSEL SUNK BY U-BOAT; SEVEN MISSING.—A British boarding vessel was sunk by a Teuton submarine on June 5, according to an official statement issued to-night by the Admiralty. Seven British sailors are missing.—*N. Y. Herald,* 14/6.

MERCANTILE CRUISER A U-BOAT VICTIM.—The British armed mercantile cruiser *Patia* (6103 tons) was torpedoed and sunk by a German submarine on June 13, according to an announcement made by the British Admiralty to-night. One officer and 15 men are presumed to have been drowned.—*N. Y. Herald,* 18/6.

HUNS CUT PIERS AT ZEEBRUGGE TO EVADE BRITISH BLOCK SHIP.—Having failed in attempts to blow up the two concrete laden ships sunk in the entrance to the Bruges Canal at Zeebrugge, the Germans are now engaged in cutting away the piers in an attempt to outflank the obstruction.

Photographs taken three days ago by British naval airmen show this, and they also show how completely the canal entrance has been blocked. So the Germans have adopted the expedient of removing the piers on the west side of the canal in order to make a large enough channel for torpedo craft and other vessels larger than submarines to pass out to sea.

The photographs, which have been viewed at the Admiralty, by the Associated Press, also show that German craft in the canal have headed westward, indicating, according to the Admiralty, that they are evidently trying to pass out by way of Ostend, where the canal entrance is not blocked as completely as at Zeebrugge.

It is doubtful, however, if there is enough water at the Ostend outlet for even the smaller boats to get to sea. Photographs made there by

British airmen show that the depth of the water at Ostend varies, a depth of as low as four feet being recorded.—*N. Y. Herald,* 25/5.

ENTRANCE TO U-BOAT BASE AT ZEEBRUGGE RAPIDLY SILTING UP.—The plight of the Germans at the Belgian submarine base of Zeebrugge, in consequence of the measures taken by the British Navy to blockade the port, is even more serious than has been believed heretofore. Photographs just taken from airplanes show that the entrance to the harbor is rapidly silting up, and that accordingly the British effort to close the channel is being reinforced by nature.

The sunken vessel inside the breakwater, which was at first believed to be an enemy destroyer, now appears to be a large dredger. The loss of this ship evidently has crippled the Germans in their attempts to clear the channel.—*N. Y. Herald,* 10/6.

OPEN 30-FOOT WAY INTO OSTEND HARBOR.—*Germans Shift Hulk of the Vindictive—Zeebrugge Still Tightly Closed.*—The Germans have succeeded in shifting the concrete-laden cruiser *Vindictive,* which was sunk in the harbor of Ostend on May 10 by British raiding forces.

The *Vindictive,* according to *The Times,* is now lying close alongside the eastern pier, leaving a passage about 30 feet wide. This is enough to allow destroyers to go in and out, but the Germans are not using the harbor.

Unsuccessful attempts have been made by the Germans to wedge a passageway between the two old cruisers sunk in the harbor of Zeebrugge. A German destroyer, sunk this week by bombs dropped by British naval airmen, lies close to the cruisers.

The basin at Bruges, which is connected with both Ostend and Zeebrugge, is full of German shipping, but the canal is not being used.—*N. Y. Times,* 26/5.

BRITISH ACTIVITY.—In view of the reiterated German statement that the British Fleet does nothing but lie in home waters and harbors, some interest attaches to a report of the British Admiralty which shows that during a single month recently the British Grand Fleet and its units steamed a total of over 1,000,000 miles, while for patrol vessels around the British coasts the figure was approximately 6,000,000 miles.—*Army and Navy Journal,* 8/6.

The British destroyer losses are undoubtedly serious, as we seem to be losing an average of one a week, but if they are to continue to perform the valuable services which are required of them as convoy, or patrol, in bad weather, at high speed and without lights, the losses are well repaid in the protection accorded. As with cruisers in former wars we never had enough, and we cannot have too many, and the omelette cannot be produced without breaking eggs.—*United Service Magazine.*

THE BRITISH CLOSE THE NORTH SEA.—The British Admiralty has recently made an announcement of the establishment of a "prohibited area in the North Sea which is dangerous to all shipping." The boundaries of this area are announced in the customary nautical phraseology as starting at such a latitude and longitude, extending to another latitude and longitude, and so on, until the starting point is reached.

To the ordinary citizen this would convey no very definite information; but if he were to take a map and plot out the boundaries of this area, as thus defined, he would find that it forms a huge triangle whose longer sides are 650 miles in length and whose base, measured on a straight line from east to west, is nearly 400 miles. He would find, moreover, that within this triangle is contained an area of approximately 122,000 square miles.

Now, although the British Government does not state why this area is prohibited, it is possible to make a pretty good guess that it is sown with

mines. How many mines it has taken to cover this vast area we are not told, but if there were only one mine to the square mile we would have 122,000, and if there were 10 to the square mile, there would be about a million and a quarter within the area. The mines may be sown more closely; but if there were but one to the mile, a submarine, in moving across the 400 miles at the base, would run more or less risk of striking 400 mines.

At first sight, one is surprised at the shape of the mine field, and asks why it has been carried so far up to the north. The answer is to be found in the fact that while the mine field has been laid right up to the Scottish coast, on the Norwegian side it terminates three miles from the coast, stopping short at the edge of the three-mile belt of neutral water. The Germans, who do not hesitate to break all laws of God and man, will not respect for a moment the neutrality of Norway, and their submarines will steal out on the edge of the mine field and so get out into the Arctic Ocean. Having

HUGE MINE FIELD CLOSING THE NORTH SEA.

done that, they will find themselves obliged to proceed north for over 600 miles before they can turn south and make for their favorite hunting grounds at the entrance to the Irish Sea and the Channel. Consequently, they will have to make a detour of some 1300 miles. Returning, the submarines will have to make the same detour.

Now, mark the significance of this. Unless they are willing to risk the peril of traveling several hundred miles across the mine-infested area, each submarine must cover 2500 miles more distance during a round trip from Kiel to the submarine zone and back, than it did before this mine field was laid.

The announcement by the Admiralty of the completion of this stupendous work coincides in time with the two raids which were recently carried out against the submarine bases at Zeebrugge and Ostend. It shows that the strong offensive against the enemy bases, for which the navy has been preparing throughout the year, is now in full swing. Admiral Jellicoe an-

nounced in a public address not many weeks ago, that, by the late summer, the public might expect to see the activities of the German submarines very materially curtailed.

Now that the North Sea has been blocked in, we may reasonably look for a considerable reduction in the losses of merchant ships.—*Scientific American*, 1/6.

BRITAIN'S NEW MINE FIELD.—Contrary to the statement made by Archibald Hurd, the naval expert of the London Daily *Telegraph*, that Britain's new mine field was the largest ever laid and embraced 121,782 square miles, it now appears that the area of the new field is only 12,758 square miles. The field takes the form of two joined parallelograms, one of which is 140 miles long and 58 miles across, and the other about 54 miles wide by 74 miles long.

This broad protective belt of mines extends across the North Sea from the Norwegian coast almost to the Orkney Islands and the Moray Firth, on the northeastern coast of Scotland. It runs along the three-mile territorial limit on the Norwegian coast from a point opposite Bergen, to Udsire Lightship, northeast of Karmo and the Skudesnaes Fjord. The northwestern corner of the new mine field is opposite Fair Island, northeast of the Orkneys. The southwestern point of the field is opposite Kinnaird Head, at the southeastern entrance to Moray Firth.—*Nautical Gazette*, 1/6.

MANY AMERICAN SHIPS IN EUROPEAN WATERS.—Certain main divisions of the United States fleet are hidden like hornet's nests in certain quarters of European waters, the whereabouts of which must, of course, not be mentioned. Of submarines, destroyers and submarine chasers many stirring tales might even now be told, though their work hardly has begun.

These vessels, very few of which are coal fed, are playing an increasingly useful part in patrolling, convoying and submarine hunting, and to them is due some of the credit for keeping down the losses by U-boat attack.

Many stories have gained currency about big "bags" of submarines and the capture of whole nests of U-boats by American destroyers, and the Germans apparently believed that American ships participated in the recent big raid on Zeebrugge and Ostend. While no credence should be attached to such tales, the United States Navy is doing its share thoroughly, and it hopes to take part in the grand triumph, if ever the Kaiser decides to send his grand fleet into action.—*N. Y. Herald*, 19/5.

FINE RECORD OF BRITISH SUBMARINES TOLD IN OFFICIAL REPORT.—An official report on the work of British submarines, made public in this country last week by the British Admiralty:

Venturesome as the enemy is with his U-boats, he rarely allows his above water craft beyond the safe confines of his harbors. He well knows that our submarines are ever on the prowl for them, and how vigilant and thorough is the watch kept may be gathered from the fact that so few opportunities are afforded them. Our submarines have successfully attacked no less than 40 enemy warships.

Night and day the search is continued. According as circumstances may dictate, the watch is kept on the surface or submerged save for the periscope, or maybe the vessels are on diving patrol, only coming to the surface every now and again to scan the horizon for any hostile craft which may come within reach.

A ship being sighted, the submarine dives to attack. As the ship is probably steaming fast on a zigzag course, a long time may elapse while the submarine is chasing or maneuvering to get into a favorable position to fire her torpedoes. While this is going on she must ascertain whether the ship is friend or foe, and at all costs she must avoid being seen. If the periscope is sighted the hostile ship will make off with all speed, and the odds are that she will get away. An irregular course and great speed

make her a difficult target, and if the sea is smooth she may see the track of a torpedo fired at her and steer to avoid it.

But in spite of all difficulties the submarines manage to drive home their attacks, and a few of their successes may be recorded.

While patrolling between the eastern Ems and Weser River a submarine sighted two lots of destroyers' smoke to southeastward. Two anxious hours were spent maneuvering for position to attack, and then, at a range of 500 yards, two torpedoes were fired, one at the bow and the other at the stern of one of the destroyers. Having fired the torpedoes, the submarine dived to avoid being detected, but a loud explosion told without doubt that one torpedo had reached its mark. Eight minutes later the destroyer was seen sinking by the stern, 15 feet of her bow still standing vertically out of water. The other destroyer was seen steaming at varying speeds and distances around the wreck. Elated at the success the submarine thirsted to put her down, too, but as two more destroyers had arrived on the scene and were systematically searching for her it was not considered feasible to continue the attack.

On another occasion two armed auxiliaries were sighted in the Heligoland Bight, and the leader, the larger of the two, was attacked and defeated, and was seen to be sinking by the stern.

It frequently happens that a submarine does not usually see her victim struck, but she invariably has the satisfaction of hearing the explosion if the torpedo gets home. This was the experience of a submarine which, patrolling one morning off the Ems, sighted an enemy destroyer and fired both bow tubes at a range of 350 yards. As the submarine dived on firing, the result was not seen, but after the lapse of a few seconds there was an exceedingly loud explosion, which was distinctly heard 25 miles away. A quick sweep around with the periscope two or three minutes later revealed no sign of the destroyer which had been fired at, but 400 yards astern was another vessel of the kind.

As the destroyer was not actually seen to be hit, at first it appeared likely that in reality there was only one enemy vessel, but after the bearings and distances had been carefully worked out this did not seem to have been possible. In view of the violence of the explosion, it is probable that the magazine blew up, and that would account for the rapid disappearance of the ship.

Yet another instance of the total disappearance of the ship may be cited. One of our submarines located an enemy submarine ahead of her and, giving chase, reduced the range to four hundred. Two torpedoes were fired, and one was seen to hit. When the smoke cleared away there was not a vestige of the hostile vessel to be seen.

These are but a few of the many instances which could be quoted showing the silent and stealthy work of the submarines.

For submarine operations to succeed it is necessary to take the enemy by surprise, and for that reason their work is a hidden mystery and their movements wrapped in obscurity. The following extract from an official report of operations in the Heligoland Bight lift for a moment the veil of secrecy and afford a glimpse into life on one of these craft.

"When a submarine is submerged her captain alone is able to see what is taking place; the success of the enterprise and the safety of the vessel depend on his skill and the nerve and the prompt, precise execution of his orders by the officers and men under his command.

"Our submarines have been pioneers in waters which have been mined. They have been subjected to skilful and well thought-out anti-submarine tactics by a highly trained and determined enemy, attacked by gun-fire and torpedo, driven to lie at the bottom at great depths to preserve battery power, hunted for hours at a time by hostile torpedo craft, and at times forced to dive under our own warships to avoid interfering with their movements.

"Sudden alterations of course and depth, the swish of propellers overhead, and the concussion of bursting shells give an indication to the

crew of the risks to which they have been exposed, and it speaks well for the morale of these young officers and men and their gallant faith in their captains that they have invariably carried out their duties quietly, keenly, and confidently under conditions that might well have tried the most hardened veterans."

The hardships undergone during stormy weather are terrible. During the winter months westerly gales were frequently experienced in the Bight, and these gales were invariably accompanied by high steep seas which made it impossible to open the conning-tower hatch. Vision was limited to that through the periscope and was only a cable or two between the seas which continually broke over them.

There was no rest at the bottom, even at 22 fathoms, as the vessels rolled and bumped dangerously. They were, consequently, compelled to keep under way at a depth clear of the keels of possible ships. When the battery power became low, the submarines had perforce to come to the surface to recharge. While on the surface it was essential to run the engines in order to keep head to sea, and through the ventilator—which with the engines running must necessarily be kept open—much water was shipped.

"The seamen got very little sleep owing to cold."

With these words the captain of a submarine concludes his report on a cruise in the North Sea. It is characteristic of the service that he should make no reference to the fact that, while the crew had got very little sleep, he had got infinitely less himself. The weather had not been good, and throughout the six days the cold had been intense—arctic in fact. At times ice formed on the periscope very quickly and obscured the vision, so that it had to be dipped every five minutes. On the surface the thermometer gave no reading, though it had a minimum of 18 per cent of frost. To receive messages by wireless was impossible, for the spray froze on the aerial forming a coating of ice two inches thick.

From time to time it was necessary to dive to remove the icicles, which over a foot long depended from portions of the superstructure. The bridge screen froze like a board, and only with difficulty could it be folded. The ice on the coats of the officers and crew did not thaw until some hours after the garments had been hung up below.

Four battleships of the *Kaiser* class were sighted by a submarine which was patrolling off the Danish coast. Probably there were other vessels in company, but owing to low visibility they were not seen. After getting into position to attack, the submarine broke surface, owing to the heavy swell, and it was necessary to go full speed to get her under again. Just before the periscope dipped sights were got on the third ship in the line, and four torpedoes were fired. The range was estimated at 4000 yards. Two loud explosions were heard, and the commanding officer of the submarine was of the opinion that the third and fourth ships in the line were each hit by a torpedo.

As the submarine was about to rise to observe the result of the shots, a destroyer was heard to pass very close overhead, and after that she was continually harassed by destroyers. Two depth charges exploded in close proximity to her, and a sweep was distinctly heard to drag over her hull. For two hours the destroyer searched diligently for her, but without success.

Some failures may be described as more glorious than victories, and the attempt of a submarine to pass through the Sound into the Baltic is surely one of these, replete as it is with pluck and persistence.

It was known that the German fleet was exercising in the Baltic, and three submarines, *X*, *Y*, and *Z*, were detailed to make the passage of the Sound and attack. It was essential that the three vessels should pass through the Sound the same night, but, unfortunately, *X* developed certain defects and was unable to keep up with the other two. The result was that she reached the entrance to the Sound the night after *Y* and *Z* had successfully made the passage. Their presence was discovered in the Baltic, and the enemy took all possible steps to prevent either their getting out of the Baltic or others getting in.

What *X* found was four merchant ships in line abreast proceeding through the narrow entrance to the Sound, and from the accurate station they kept it was evident they were sweeping. Beyond them were destroyers. These ships were all showing navigation lights, and, accordingly, *X* thought it best to do so, too, hoping to pass without attracting attention.

She had not proceeded far before she was detected by a destroyer, which tried to ram her. Her only course was to dive, and as she sank in the water she heard a thrashing of the enemy's propellers above her. To make the passage with light burning was clearly out of the question, and, nothing daunted, she returned silently and stealthily, creeping on the surface until she got into the wake of a vessel proceeding through the Sound, trusting to be able to follow her unobserved.

For a while it seemed as if the plan would succeed, but suddenly the vessel she was following stopped. As luck would have it, she was a destroyer, which at once endeavored to ram her. Again she dived. A third and fourth attempt brought no greater success. The enemy, thoroughly alarmed, were ever on the alert to ram her.

Another effort would not only have been hopeless, but would have unjustifiably risked the boat and the lives of the crew, so she returned to her base, as her gallant commander expressed it in his report, "prior to making a further attempt."

The enemy, however, is up to many tricks, and decoy ships have been known to give a submarine a sharp surprise. On one occasion the submarine sighted what appeared to be a merchant ship and gave chase, showing her signal "Stop engines" and "Send a boat." When the submarine had closed to about a mile the steamer hoisted a German naval ensign and opened fire with a 6-inch gun, at the same time increasing speed and altering course so as to ram the submarine. At the time the submarine gun was manned the signals were still flying, and there was altogether about 12 men on her deck, but she just managed to dive in time. Two or three minutes later two loud explosions were heard overhead. Beyond shaking the boat violently they did no damage.

From time to time instances of encounters occur between our submarines and those of the enemy, which prove inclusive. After many hours of dead reckoning a submarine cannot be sure of her position, and in one such encounter the British thought for some time that her adversary, which was approximately end-on, was her consort out of station. Realizing her mistake she dived at once, but before she could pick up the German in her periscope the latter had also dived. Under these circumstances "stalemate" was practically inevitable, and after an hour and a half, during which they simultaneously arose and simultaneously dived again, each maneuvering for a favorable position for attack, the German retired out of the area.—*N. Y. Herald*, 12/6.

BALTIC AND SKAGERRACK

BALTIC FLEET SAFE.—The first detachment of the Baltic fleet arrived last night at Kronstadt from Helsingfors. It was composed of battleships and cruisers. The second squadron, composed of torpedo-boats and submarines, is already reported off Kronstadt. The third squadron, including transports, armed merchantmen, and torpedo-boats of an obsolete type left Helsingfors last night and is expected at Kronstadt to-day. The total number of vessels which have left is 200.—*Reuter.—London Times*, 12/4.

TELL OF DESTROYING THEIR SUBMARINES.—An account of the destruction of the seven British submarines at Helsingfors was given to the Associated Press correspondent in a port where he met several members of the crew of the submarines and whence he traveled back to England on the same steamer with them.

The British crews got out of Helsingfors only 12 hours ahead of the Germans' entrance into the town. The men assured the correspondent that they had effected the complete destruction of their underwater craft before leaving.

The submarines, which had entered the Baltic at early periods in the war and had been in constant service since, were frozen solidly in the ice in Helsingfors, which made their escape impossible. It was suggested that the ice be dug out around them and that they should then make an attempt to dive underneath the ice and reach clear water outside the harbor. After considering the plan carefully, however, the British commanders decided that it was impracticable.

For the purpose of destroying the submarines large quantities of explosives were placed inside them and exploded. The series of explosions shook the entire city of Helsingfors and the detonations were heard for miles. At the same time the large stock of torpedoes and spare parts on hand was also blown up.

After an inspection had shown that the work had been effectively done the British crews left the city and retired northward across Finland into Russia, reporting for duty a fortnight later at a submarine base in England.

The property value of the craft and the material destroyed reached a total of about £500,000.—*Baltimore American,* 18/5.

Before retreating from the harbor of Hango in southwestern Finland in April last, Russian navy officers succeeded in destroying the four Russian submarines built in the United States. Seven British-built submarines also were destroyed when the German naval forces and transports approached Hango. None of the British-built vessels fell into the hands of the enemy, the British Admiralty has announced. All British submarines in the harbor of Helsingfors also were destroyed when the German naval forces approached that city because it was impossible to get them away, as they were frozen fast. The submarines, which had been operating in the Baltic since the early part of the war, were blown up, together with their stocks of torpedoes, ammunition and other materials. Their crews have arrived in England, having traveled by way of Mourmansk.—*Army and Navy Journal,* 8/6.

FOE TAKES ISLAND NEAR PETROGRAD.—German troops have occupied Bjorko, an island in the Gulf of Finland, south of Viborg and 30 miles northwest of Petrograd.—*N. Y. Herald,* 20/5.

MEDITERRANEAN

FRENCH SEAPLANE ATTACKED THE "U-39."—The German submarine *U-39,* according to a Havas despatch from Cartagena, probably was damaged in an encounter with a French hydroairplane off Gibraltar. The U-boat was on patrol duty off the Moroccan coast when it was sighted by the airman, who opened fire and dropped bombs. Several hits were made, and the submarine was forced to submerge. It regained the surface with difficulty and was joined by a second U-boat, which accompanied it to Cartagena.—*N. Y. Herald,* 21/5.

U-BOAT ATTACKER OF THE "LUSITANIA" BADLY DAMAGED.—The German submarine *U-39,* says an official despatch from Cartagena, entered that port last night in a damaged condition.

The *U-39* is seriously damaged as the result of a battle. Another submarine accompanied the U-boat as far as the entrance to the port and then disappeared.

The escorting submarine came so close to the harbor that the dock idlers plainly made out both vessels. Then, assured that the *U-39* had reached a place of safety, she sped out to sea.

The strictest orders were immediately issued for guarding the submarine, which was damaged about the hull. The batteries and accumulators of the *U-39* have been almost entirely destroyed.

The commander entertained the German consul soon after the arrival of the submarine, and a few other persons were allowed aboard.

The *U-39* is 220 feet long and carries a crew of 30 men. The crew has been forbidden by the authorities to communicate with shore. The interned submarine is being guarded by the Spanish cruiser *Extramadura*.

The *U-39*, according to German advices, is the submarine that torpedoed the *Lusitania* off Kinsale on May 7, 1915. A despatch from Munich, Bavaria, received in Switzerland on May 8, said that it was the *U-39* that sank the British steamship. On March 11, 1916, it was reported in Washington that it was the *U-39* which attacked the American tanker *Petrolite* off the coast of Egypt in December, 1915. It is possible that the old *U-39* may be out of service by this time and that her number has been taken by a new boat.—*N. Y. Herald*, 21/5.

GERMAN SUBMARINE ENTERS SPANISH PORT.—It is officially announced that the German submarine *No. 65* entered the port of Santander at 6 o'clock this morning.—*Evening Star*, 25/5.

U-BOATS SANK THREE OTHER SHIPS WITH THE "TYLER."—The story of the loss on May 2 of the American steamship *Tyler*, as told by several of the crew yesterday when appearing at the office of Patrick Quinn, United States Commissioner, to receive their pay, disclosed for the first time that two German submarines attacked the *Tyler* and several other steamships in her convoy, that four of the steamships were sunk, and that British patrol vessels had great difficulty in protecting the other vessels of the fleet.

Eleven persons lost their lives when the *Tyler* was torpedoed in the Mediterranean, as told in the *Herald* on May 8. Five of these were naval gunners and the other six men of the engine room force. The *Tyler*, of 3928 gross tons, was bound for Genoa, loaded with grain. She was formerly of the Old Dominion line and was built in 1913.

The British steamship *Franklyn*, a cargo carrier of 4919 gross tons, also was torpedoed and sunk during the attack. Her crew and the survivors from the *Tyler* were picked up by British patrol vessels and landed at a French port. The names of the other vessels were unknown to the crew of the *Tyler*.

"At 13 minutes past two o'clock on the morning of May 2 the five men of the gun crew on watch by the stern gun were killed instantly and the stern of the *Tyler* was torn away when a torpedo struck directly beneath them," said John Willibald, one of the seamen, telling of the sinking. "Within a few minutes another torpedo was launched by the German submarine, and this hit the after end of the steamship, back of the engine room, killing six men.

"The other men on board the *Tyler* rushed for the life-boats, but the steamship sank so quickly all were forced to jump overboard.

"Britsh patrols came steaming up, following the alarm. As an unsuccessful attempt had been made just before midnight to torpedo the *Tyler* the patrol boats were ready. The torpedo, however, struck the bow and glanced off. We were in a convoy of several freighters loaded with grain for an Italian port, and although it was a moonlight night and the patrol boats became remarkably active after the first torpedo was launched no trace of the submarine was found.

"When finally the torpedo struck the *Tyler* in the stern and it was all up with us the other steamships of the fleet began puffing some streams to shield them from further attack. As volumes of smoke clouded the entire fleet a converted yacht searching for submarines collided with one of the British naval patrols. The yacht was badly damaged.

"Suddenly another explosion was heard, and it was soon learned the *Franklyn* was torpedoed. She went down in a few minutes, the crew jumping overboard. All on board were saved.

"During the running attack two more of the freight steamships went down."—*N. Y. Herald*, 28/5.

ONE HUNDRED AND ONE DROWN WHEN U-BOAT TORPEDOES TRANSPORT VESSEL.—The transport ship *Leasowe Castle* has been sunk by an enemy submarine, the British Admiralty announced to-night. One hundred and one persons were drowned.

The *Leasowe Castle*, which was of 9737 tons gross, was sunk in the Mediterranean on May 26. Among those who lost their lives were 13 military officers and 79 soldiers of other rank.

The *Leasowe Castle* was built in 1917 at Birkenhead and was owned by the Union Castle Mail Steamship Company of London.

The text of the British Admiralty statement reads:

"The transport *Leasowe Castle* was torpedoed and sunk by an enemy submarine May 26 in the Mediterranean.

"Thirteen military officers and 79 of other ranks, and of the ship's company the captain, two wireless operators and six of other ratings, are missing. It is presumed all were drowned."—*N. Y. Herald*, 30/5.

DESTROYER ENGAGEMENT BETWEEN BRITISH AND AUSTRIANS.—During the early part of the night of the 22d of April, two British destroyers encountered and engaged five Austrian destroyers in the Adriatic. The enemy fled for the fortified port of Durazzo, pursued by the two British vessels, and by five more British destroyers and one French destroyer. The chase lasted for more than 2½ hours, when contact with the enemy was lost. The British casualties amounted to seven killed and 19 wounded. Next day, Durazzo was attacked by British airmen, who dropped nearly a ton of bombs on the enemy's seaplane sheds. Only one war vessel, a gunboat, was found to be in the harbor.—*The Engineer*, 3/5.

ITALIAN NAVAL RAID ON HARBOR OF POLA FULL OF ADVENTURE.—The details of the recent Italian naval exploit at Pola in which one battleship of the *Viribus Unitis* class was sunk show that it was one of the most audacious feats of the war, worthy to rank with the British at Zeebrugge and the *Merrimac* at Santiago.

The raid was long matured by Lieutenant Commander Pellegrini, who adopted unusual means of secrecy to safeguard the project. To divert attention he took service in the trenches on the Piave, and when ready to start gave out that he was going to see his friends. He was accompanied by another officer and two sailors.

The party was escorted by destroyers and arrived at Pola at two o'clock in the morning. It was very dark, as the moon had been down two hours. A light wind blew offshore, which prevented the sounds of preparation going landward. The entrance of the channel was 400 yards across, with a long neck leading into the great harbor, in which lay Austria's fleet of battleships, cruisers and destroyers, encircled by a frowning terrace of land batteries.

In the obscurity the guardship at the entrance was dimly visible, swung to one side, the guards apparently asleep. There was complete lack of watchfulness.

Final preparation was now made for a dash in the darkness. Commander Pellegrini and his companions put on rubber suits which could be inflated. The intention was to discharge torpedoes at the big ship, then blow up their own craft, jump overboard and await capture or drowning. All realized that there was practically no chance of returning alive.

Commander Pellegrini was perfectly cool as he bade good-bye, his superior officer saying, "You are putting your head into the lion's mouth."—*N. Y. Herald*, 23/5.

An Austrian torpedo-boat destroyer was sunk by British airmen at Durazzo on May 29, it was officially announced from Rome.—*Army and Navy Journal*, 8/6.

SUCCESSFUL ITALIAN NAVAL FEAT.—Italian navy officers on June 10 again demonstrated their prowess by making a brilliant and successful attack on the Austrian fleet off the Dalmatian Islands in the Adriatic, on the Austrian side. The daring exploit resulted in the sinking of the 20,000-ton battleship *Szent Istvan* by two torpedoes, while a second battleship of the same class was badly damaged. The chief of staff of the Italian Navy announces that the bold attack was made by two small torpedo-boats in command of Commanders Rizzo and Lugi de Milazzo. In an interview with Commander Rizzo in Rome on June 12, reported by the Associated Press, the Italian boats that made the attack are referred to as "motor-boats." In addition to firing two 500-pound torpedoes at the *Szent Istvan*, Commander Rizzo says he threw a depth bomb right in the path of the nearest pursuing Austrian destroyer. This, he says, exploded under the destroyer and disabled her, thus permitting the two Italian boats to escape.

The success is among the most remarkable sea actions of the war. The torpedo attack was made boldly through the line of Austrian destroyers, while the battle squadron was steaming in regular formation. This makes the third Austrian battleship of the dreadnought class that the Italians have sent to the bottom by brilliant torpedo work. The *Szent Istvan* was the newest of the powerful *Viribus Unitis* class. She was completed in 1915 and had a length of 525 feet. Her main armor belt was 11 inches thick and her turrets and barbettes had similar armor. Her speed was about 20 knots; main battery, twelve 12-inch guns in triple gun turrets, on a center line; complement about 1000 officers and men.

One of the surprising features of this successful attack is that both the Italian torpedo-boats returned safely to their base, and also inflicted severe damage on a pursuing Austrian destroyer.—*Army and Navy Journal*, 15/6.

BLACK SEA AND BOSPHORUS

Details of the attempts of British airmen to destroy the Turkish battle cruiser *Goeben*, while she lay stranded at Nagara Burnu at the Dardanelles from Jan. 20 to 27, show that, despite the most brilliant work of the naval aviators, the *Goeben* could not be destroyed or rendered incapable of getting safely away. During the seven days she lay aground no less than 276 flights over her were made by British naval aviators, and at least 16 direct hits were made and bombs to the approximate weight of 15 tons were dropped, yet she was safely floated on Jan. 27 and reached a Turkish dock yard for repairs. "The conclusion to be drawn from this incident," says the London *Engineers*, "is that large, strongly built, and well-protected warships are by no means so vulnerable to attack from the air as might be supposed. On this occasion the conditions certainly favored the attack. The battle cruiser, 610 feet long, and nearly 97 feet broad, offered a large and stationary target, while the anti-aircraft defenses in the vicinity must have been largely improvised. The attacking machines were therefore able to descend to comparatively low altitudes, and to score 16 direct hits. But bombs dropped at a height of 3000 feet to 4000 feet have only a moderate degree of penetrating power, which doubtless explains why the *Goeben* was not disabled. She is, indeed, admirably protected against this form of attack, having two 3-inch steel decks over her vital parts. A hit from a height of 7000 feet or 8000 feet might have been more effective, but at such an altitude accurate bomb dropping on an isolated target is, of course impossible. The escape of the *Goeben* is a sufficient commentary on the scheme, which has been mooted both here and in the United States, for a great air offensive against the German naval bases, with the object of placing the High Sea Fleet *hors de combat* at its moorings."—*Army and Navy Journal*, 8/6.

SOVIETS READY TO GIVE UP WARSHIPS.—Mr. Tchitcherin, the Bolshevik Foreign Minister, has sent a wireless despatch to Ambassador Joffe in Berlin, according to a despatch received by the Havas Agency from Moscow, announcing that the Bolshevik government is ready to surrender the Russian Black Sea fleet to Germany on condition that the warships be restored to Russia after peace has been declared and that the Germans refrain from using the vessels. The conditions also stipulate that the German invasion of Russia shall come to an end.—*N. Y. Herald*, 7/6.

CAPTURE OF RUSSIA'S BLACK SEA FLEET.—In announcing the capture of the Russian Black Sea fleet at Odessa German reports state that the bunkers of the ships were empty and that a majority of the vessels had been so neglected that only the battleship *Volga* and the cruisers *Pamyat* and *Merkuria* were in serviceable condition. The remainder of the fleet consisted of the battleship *Rostislaff*, the cruiser *Potemkine* and a number of torpedo-boats and submarines and 20 transports. The protected motor-boat flotilla had been previously seized at Odessa, as had been the new war vessels lying on the slips. The latter consisted of a dreadnought of 23,000 tons of the 1911 class, two protected cruisers of 7600 tons each, and two unprotected cruisers.—*Army and Navy Journal*, 8/5.

In appraising the value of the news from Turkey in regard to the alleged capture of the Russian Black Sea fleet by the Germans, it is well to remember that this is the second time this claim has been made, and on the first occasion it was proved incorrect. When the Germans occupied Odessa in March, 15 Russian warships were said to have been in the harbor, and to have fallen into the hands of the enemy, but two days later it was admitted that the Russian fleet had withdrawn to Sebastopol. There was indeed no apparent reason why the Russians should give up their ships. The fleet, even after the massacre of officers in December, was still ostensibly under Bolshevik control, and shortly afterwards Admiral Sablin was appointed to command it. The action of the ships, when such action has been reported, has not favored the idea that those in command were amicably disposed towards the Germans. Indeed, in April, Germany was reported to have complained to the Russian Government of attacks by the Black Sea fleet on the forces of the Central Powers, and notice was given that unless these attacks were stopped the Russian warships would be treated as hostile. It does not seem altogether probable, therefore, that when the Germans occupied Sebastopol the Black Sea fleet would have remained there to be captured. On the other hand, the occupation of Sebastopol is even a greater blow to Russian naval power than the capture of Nikolaieff. By the latter event the principal naval yard in the Black Sea fell into German hands, with the hulls of some fine ships that were building there, but Sebastopol is even more valuable as the headquarters of the navy, and probably the only base where the ships are likely to be able to obtain coal and ammunition and necessary stores. If then the fleet had to put to sea, its life was likely to be a short one. A further element of doubt may be found in the Turkish *communiqué* which states that the *Goeben* with the *Hamidieh* and some torpedo craft arrived at Sebastopol on Thursday last. It can surprise no one that the *Goeben* has turned up again, but she would hardly be taken to Sebastopol if a hostile force was lying in the harbor there. The situation is not without unpleasant features, so far as the Allies are concerned, and further developments will be awaited with considerable interest.—*The Army and Navy Gazette*, 11/5.

PACIFIC AND INDIAN OCEANS

THE "WOLF."—We have heard of the return to Europe of the two German raiders, the *Wolf* and *Wolf's* cub. The report of what has occurred as given in the *Times* of February 26 is evidently incomplete, but it is stated that the *Wolf* had been cruising for 15 months, nearly the

whole time at sea, and the Admiralty give a list of 11 missing ships with their names, aggregating 32,864 tons, which she is supposed to have sunk, viz.: six British, three American, one Japanese, and one Spanish. The German reports name larger losses, which have been generally contradicted by the Admiralty, and according to one report the *Wolf* returned to Pola, "having repeatedly failed to get through the North Sea," but it is believed this is a mistake, and that she returned to Kiel. The *Wolf's* cub was badly ashore on the Jutland coast when last heard of, and is reported to be a total loss. The Admiralty report that the British steamer *Turritella*, of 5528 tons, one of the *Wolf's* captures, was equipped for mine-laying in the Gulf of Aden; but being met a few days later by one of our cruisers was sunk by her own crew, who were taken prisoners. If the Admiralty's report of the losses sustained by the action of the *Wolf* is correct, they were considerably less than those caused by the *Moewe*, which is probably due to her avoiding the principal trade routes: the losses caused by the *Moewe* having amounted to 57,000 tons and 112,000 tons respectively in her first and second cruises. It would be interesting to hear more of the *Wolf's* movements, especially as she seems to have avoided all frequented ports, so that probably she was hidden away somewhere like the *Dresden*, and we must admit that it was a feat of skill and good seamanship to have kept the sea for such a long period, and escaping capture. We may hope that some of the crews of the ships destroyed will be able to give us in due course details of the *Wolfe's* remarkable cruise; any German accounts which may be given are sure to be not only grossly exaggerated but intentionally misleading.—*United Service Magazine.*

AMERICAN GUNBOAT HITS ROCK.—An American gunboat proceeding to Chungking struck a rock 10 miles from Ichang Tuesday. Although badly damaged she succeeded in returning to port.—*Evening Star*, 27/5.

DESTROY TWO GERMAN MINES OFF NEW ZEALAND COAST.—Two enemy mines have been destroyed off North Cape, the northern extremity of New Zealand.

It is most likely the mines found floating off the north coast of New Zealand were laid by a German commerce raider. They probably were sowed by the raider *Seeadler*, formerly the American ship *Pass of Balmana*, which, after roaming the Pacific for seven months, preying on American and allied shipping, was stranded on one of the Society Islands.—*N. Y. Herald*, 14/6.

GENERAL NOTES

SUBMARINES

FRENCH LOSSES.—The French Minister of Marine reports the loss of the submarine *Diane*, which has not returned to port and is believed lost. No other allied losses reported.—*United Service Magazine.*

FRENCH SUBMARINE SUNK.—Paris announces that the French submarine *Prairial* was sunk in a collision with a merchant ship. Part of the crew were saved.—*Literary Digest*, 18/5.

U. S. HAS SUNK 28 U-BOATS.—"Since January 1 our navy has sunk 28 German submarines and our sailors should have the credit for it," declared United States Senator John W. Weeks, member of the Senate Military Affairs Committee, in addressing the Massachusetts Laundry Owners' Association here to-day.

"I believe when a heroic deed is done it should be made public," he added.—*N. Y. Herald*, 16/6.

AMERICAN VESSELS SUNK.—Up to May 25 vessels lost in the war under the American flag numbered 94, aggregating 243,412. Lives lost numbered

377. Vessels lost this year are the *Harry Luckenbach, Julia Frances, Alamance, Santa Maria, A. E. Whyland, A. A. Haven, Atlantic Sun, Chattahoochee, Lakemoor, City of Pensacola, Tyler* and *William Rockefeller.*—*Marine Journal*, 8/6.

SPAIN'S U-BOAT LOSSES.—Seventy-eight Spanish merchantmen have been sunk by German submarines, according to a list printed by the *Epoca*, in a discussion of what Spain has suffered since the beginning of the U-boat campaign. The Taya Company, of Barcelona, has been the heaviest individual loser.—*Nautical Gazette*, 6/1.

U-BOAT BASES BLOCKED, SINKINGS FALLING OFF.—Enemy submarine operations have lessened greatly in the western and central English Channel since the blockading of Zeebrugge and Ostend.

The number of submarines operating also has appreciably diminished, owing to the severe losses in recent months.—*Evening Star*, 15/6.

FOURTEEN NORWEGIAN SHIPS WERE SUNK IN MAY.—Fourteen Norwegian vessels, registering a total of 12,000 tons, were sunk and two seamen lost their lives in the month of May through war causes. This announcement was made by the Norwegian Legation to-day.—*N. Y. Herald*, 7/6.

U-BOAT COMMANDER ORDERED TO EXPLAIN SWISS SHIP SINKING.—*Submarine Which Attacked the Sardinero Reaches German Base.*—The German submarine which sank the steamship *Sardinero* last February, has returned to a German base, and her commander has been ordered to make a full report of the occurrence. Switzerland demands restitution in kind of the cargo of wheat which went down with the ship.

[The *Sardinero* was a Spanish steamship, which probably was chartered by the Swiss Government for the transportation of food supplies.]—*N. Y. Herald*, 30/5.

SIXTY PER CENT OF HUN U-BOATS SUNK, SENATE IS TOLD.—"I want to assure those who are panic stricken that there is no need for panic at all, for we have a navy that is 'up to snuff'; they can take care of our cities and everything else, and they will hunt down these damned devils and wipe them off the face of the earth, so everybody can sleep in peace."

This statement was made to the Senate this afternoon by Senator Tillman, of South Carolina, chairman of the Senate Naval Affairs Committee, on the basis of information furnished him by Josephus Daniels, Secretary of the Navy.

The senator read to the Senate an extract of a letter written by Mr. Daniels in response to a request for information on the submarine activities.

"After conference with Admiral Benson and other naval officers it has been agreed that it would be exceedingly unwise at this time to give out any information which could be used to advantage by the enemy," Mr. Daniels wrote.

"Submarine hunting is at best a most elusive thing. Be assured that everything that can be done is being done. All naval units are disposed of in a manner dictated by experience and study of the subject.

"If you feel disposed you may state that you are assured that all possible steps are being taken."

Senator Swanson, of Virginia, a member of the Senate Naval Affairs Committee, after a conference at the Navy Department, said he was inclined to believe the submarines had been driven away from the coast and the main shipping routes, at least temporarily. He declared that the movement of troops and supplies would continue without interruption.

The senator said he was informed that allied and American co-operation had resulted in the destruction of fully 60 per cent of all the German submarines constructed and commenced. If the purpose of the German

U-boat raid was to draw American naval craft away from European waters to protect shipping on this side of the Atlantic it had failed utterly, he said. No American war vessels co-operating with the allied fleets abroad had been or would be withdrawn for home service because of the raid, he declared.

"Indications of the last few days are that the submarines have been driven at present from the coast and from the main lines of travel of American vessels," continued Senator Swanson. "The Navy Department is not disturbed and is doing everything possible that could be done, so that I am confident no German submarines will be able to do any further serious damage on this side. Movement of troops and food will continue uninterruptedly."—*N. Y. Herald*, 8/6.

ATTACKS ON U-BOATS AVERAGE 70 A WEEK, LORD GEDDES SAYS.—In an interview with the London correspondent of the *Petit Parisien*, Sir Eric Geddes, First Lord of the Admiralty, had the following to say with regard to submarines:

"The allied navies continue to sink more German submarines than the enemy can build. It is certainly a fact that since January we have sunk more submarines than they have built. We attack their submarines 70 times a week on the average.

"We base our returns of submarines destroyed only on those we are sure of having seen wrecks or secured the crews, but most of the other submarines hit are in urgent need of repairs, and it is evident the results of many of our attacks are unknown. If you have moles in your garden you may put down a thousand traps without catching any of them, and it is the same with submarines."—*N. Y. Herald*, 14/6.

THE TURN OF THE TIDE.—For three years or more, the tide of German U-boat piracy has been setting steadily against the shipping of the Allies. During that stretch of time nearly 12,000,000 tons in shipping and nearly 15,000 lives have been chalked up in blood-red figures to swell the list of Prussian atrocities.

But we have reached the turn of the tide. By the time these words are read, the increasing toll which is being taken of German submarines and the decreasing toll of destroyed allied ships will have brought us to the point where we are putting ships afloat faster than the submarine is sinking them.

The Prussian is highly efficient, and never more so than when he sets out to lie; and German officialdom is lying to the German people about the submarine situation. It is magnifying the allied shipping losses in an ever increasing ratio, and it is minimizing its own losses of submarines in equal measure.

Vice Admiral Sims recently referred to the fact that the submarine campaign reached its highest point in April of last year, and that it has been steadily declining ever since; so that in December of last year losses were 386,000 tons, and in April had declined still further to 269,000 tons. The German authorities, however, have more than doubled these figures in the lists sent out to the German people. Thus, Germany claimed for December, 702,000 tons sunk as against actual losses of 386,000 tons; in January, the claim was 632,000 tons—the actual loss was 302,000 tons; in February she claimed 689,000 tons—the true figure is 332,000 tons; in March, she claimed 680,000 tons as against 358,000 tons; and in April, when 269,000 tons was sunk the German people, their precious collection of allies and any one else who believes that Germany is capable of speaking the truth, were given to believe that 600,000 tons were sunk.

It is gratifying to compare the April loss for this year of 268,000 tons with the April loss of last year, which was the first year of unrestricted submarine warfare, when the submarines sunk a total of 871,000 tons.

The French Minister of Marine, Georges Leygues, draws attention to the fact that, if the total of allied shipping destroyed in the first four months

of this year, as given above, were to be maintained throughout the year, the year's total losses would be about 3,700,000 tons; and he notes that this is less than the estimated amount of tonnage which our Shipping Board expects to build in the same time. So we see that, even in the unlikely event of the Germans being able to maintain their present rate of sinking, the losses will be more than offset by the American effort. Consequently, since Great Britain, France and Japan will launch this year between them about 2,000,000 tons, and the chartered Japanese and Norwegian ships and the requisitioned Dutch vessels amount to over 1,000,000 tons, there will be a total of gain for the year for the allied cause, of over 3,000,000 tons of shipping. It is probable, however, that the destruction of German U-boats will proceed at an accelerating rate for three reasons: First, the convoy system, which is all the time being perfected in its tactics, is becoming increasingly efficient; second, during the year there will be an enormous addition to the anti-U-boat fleets due to the completion of the destroyer and chaser programs, both of Great Britain and ourselves; and thirdly, because strongly offensive operations, of which the recent raids against Zeebrugge and Ostend, are a fair test, will be prosecuted throughout the year.—*Scientific American*, 25/5.

FORTY THOUSAND TONS OF SHIPPING APRIL GAIN ON U-BOATS.—As proof that the Allies are rapidly overcoming the submarine menace, Georges Leygues, the Minister of Marine, informed the army and navy war committees of the Senate yesterday that Great Britain and the United States alone had constructed in April 40,000 tons more shipping than was sunk by the enemy.

The minister declared also that the means employed to rid the seas of submarines had become increasingly effective since January and had given decisive results.

The minister pointed out the tremendous strides recently made by the Allies in repairing ships damaged by torpedoes or mines, and declared that co-ordination between the allied nations had become so smooth during the last four months that the tonnage restored to the sea exceeded 500,000 tons weekly.

As to the increasing destruction of submarines, which was constant, said the minister, the figures for April were excellent, showing an increase over the preceding months, but were far surpassed by the results known to have been attained thus far in May.—*Evening Star*, 27/5.

FOUR HUNDRED AND SEVEN SHIPS ARE SALVAGED; SUNK BY THE GERMANS.—From January, 1915, to the end of May, 1918, 407 ships sunk by the Germans in British waters have been salvaged, according to details of the Admiralty salvage department made public in the press to-day.

Up to December, 1917, 260 ships were recovered. In the present year to the end of May, 147 have been salvaged, the increase being due to improved methods and not to the greater activity of U-boats.

Among the difficulties encountered has been the emission of poisonous gases from the rotting cargoes of sunken ships which sometimes have caused the loss of lives. One salvage ship was torpedoed while working on a wreck, while sometimes the work of weeks is destroyed by the rough sea. Feats performed by the salvage department include the raising of a large collier sunk in 12 fathoms of water, and involving a dead lift of 3500 tons.

Another vessel was raised 15 fathoms by the use of compressed air.—*Evening Star*, 17/6.

SEVENTEEN MILLION CARRIED BY BRITISH SHIPS DESPITE U-BOATS.—An example of the routine work carried out by the British Admiralty during the three and a half years of war is shown in the fact that despite Germany's submarines, 17,000,000 passengers have been conducted in military transports backward and forward to the various theaters of war. The

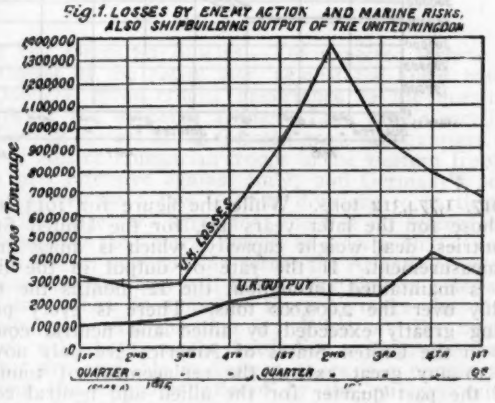
number of animals conveyed exceeds 2,000,000. The number of vehicles carried was more than 400,000, and the quantity of stores transported was in excess of 37,000,000 tons.

In addition considerable assistance in transport has been given by British ships to other allied powers.

The British Admiralty has carried nearly a million tons of stores for the Italian Government and also about three and a half million tons of coal for Italy in requisitioned steamships.—*N. Y. Herald*, 14/6.

ADMIRAL SIMS AND THE SUBMARINE.—At the dinner given by the National Sporting Club to officers of the American Army and Navy last week Admiral Sims struck a quietly optimistic note. With regard to the progress of the submarine campaign in particular he evidently agrees with Lord Jellicoe and other public men in this country who hope to see the U-boat menace mastered by the end of the summer. Admiral Sims, who, like most Americans in high position, speaks well, and unlike some of them, tersely, pointed out that our losses in merchantmen reached their highest point in April of last year, since when they had declined with greater or less steadiness. In the meantime the output of new construction has grown in inverse ratio, so that if the one curve continued to fall and the other to rise at their present rate, in less than a fortnight they should cross. The near prospect is, then, that while the allies will be adding to their merchantmen in their shipyards and lessening the number of hostile submarines preying on the world's commerce, the power of these to decrease allied and neutral tonnage will be less than the power of the allies to increase it. Admiral Sims believes that Germany knows this as well as we do, and is, in fact, one of the governing causes of the present great offensive in France and Flanders. If she could starve us into surrender cheaply at sea she would not risk enormous losses on land in pursuit of the mirage of victory. But, as Admiral Sims concludes, "it is her last chance."—*Army and Navy Gazette*, 18/5.

SHIP LOSSES AND REPLACEMENT.—The official returns issued on Wednesday, of new merchant ship construction in the United Kingdom and in allied and neutral countries, reveals unsatisfactory progress. The output

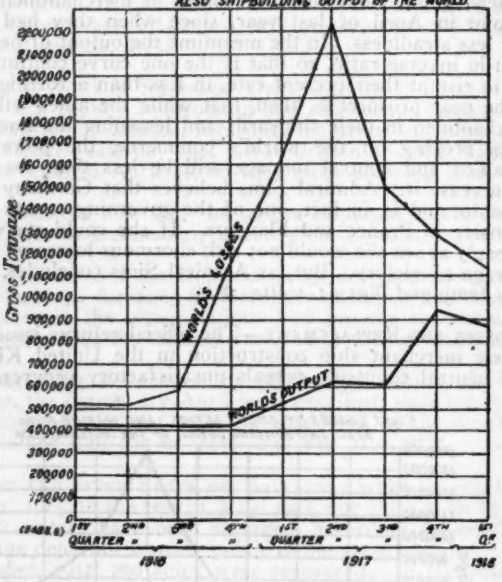


in the United Kingdom during April was only 111,533 tons, which is 50,000 tons less than in March, although better than in February or January. It is considerably less than the average output in the last quarter of last year, the monthly average for these three months having been nearly 140,000 tons. These facts, considered in the light of all that was done in the late

summer and early autumn to speed up production, and the promises made that the standard ships could be built in eight months by a great number of firms, proves without doubt that the best is not being got from our shipbuilding resources, from the standpoint of material and personnel. This situation cannot be brought too forcibly to the attention of all responsible for merchant shipbuilding, and no doubt Lord Pirrie will take such action as may be required in order to ensure that degree of acceleration the possibility of which is so obvious.

The production of allied and neutral countries is rather more satisfactory. The output for the first quarter of this year is now officially given as 544,327 gross tons, while the average per quarter in 1917 was about 443,600 tons. Both in 1917 and 1916 there was considerable development in shipbuilding in those countries. In 1913 the gross tonnage of vessels built in allied and neutral countries was 873,000 tons, whereas in 1916 it was 1,146,448 tons,

Fig. 2. LOSSES BY ENEMY ACTION AND MARINE RISKS; ALSO SHIPBUILDING OUTPUT OF THE WORLD.



and in 1917, 1,774,312 tons. While the figure for 1913 is gross register tonnage those for the later years are, for the United States and some other countries, dead-weight capacity, which is much greater than the register measurement. If the rate of output in the first quarter of this year is maintained throughout the 12 months the total should be considerably over the 2,000,000 tons. There is every prospect of this figure being greatly exceeded by allied and neutral countries, because the yards in the United States of America are only now beginning to influence, to any great extent, the replacement of tonnage lost. The output of the past quarter for the allied and neutral countries, shows an increase of nearly 25 per cent upon the average quarterly output in 1917 while in the case of the United Kingdom the increase is at the rate of only about 10 per cent. It is true that a much larger proportion of the shipbuilding resources in this country are being utilized for the construction of fighting ships and for the vessels operating under the direct control of the Admiralty. In this country, too, a fair proportion of the shipbuilding plant

is required for the repair of ships disabled by submarine and other attack, and the official statement is made that since January the increase in the merchant ships which have been repaired and returned to service is equal to 40 per cent. Even so, it is a matter for regret that the increase on the United Kingdom output of last year has not been much more equal to that for the allied and neutral countries.

In order to show vividly how the replacement of tonnage compares with the losses due to the war, we give, first, a diagram showing the United Kingdom merchant tonnage lost through enemy action and marine risks for the past two years, and the tonnage completed during the same period in the United Kingdom. It will be seen that the losses due to submarines continue steadily to decrease, but the check in the increase in tonnage completed is most marked. In other words, the rate of diminution in tonnage lost, as compared with three months ago, corresponds exactly almost to the rate of diminution in output. Thus the lines of tonnage lost and tonnage completed move downward almost in parallel for the past three months, whereas they ought to have been converging lines; if the advance in the last quarter of last year had been continued we should have reached the most desirable stage of output equalling losses. In the first quarter of this year the British losses were 687,576 tons and the replacements only 320,280 tons. This is unsatisfactory, and the fact must be brought home to all concerned in the building of ships.

The second diagram shows corresponding curves for the world's merchant tonnage losses through enemy action and marine risk, and the world's output. Here the results correspond with those for the United Kingdom. The decrease in losses has a parallel in the decrease of tonnage completed. In other words, the world's total losses between January and March totalled 1,123,510 tons, while in the same period the tonnage completed was 864,607 tons. This, too, notwithstanding that the new tonnage given for some countries is the dead-weight carrying capacity and not the gross registered tonnage, which is considerably less than the carrying capacity. There is no hope, however, that the situation is gradually improving, and we trust that when the next monthly return of shipbuilding is issued the figures will be much more favorable.—*Engineering*, 10/5.

MILITARY

STRENGTH OF THE OPPOSING ARMIES.—The expected terriffic onslaught, perhaps the greatest of the entire war, against the allied battlefront in France and Flanders, gives crucial importance to the question of the relative strength of the opposing armies. Last week's meeting of the Austrian and German kaisers at the German great headquarters may result in the dispatch of Austro-Hungarian troops to the western front or to the launching of a new offensive against Italy; and Germany's peace treaty with Rumania may release a few German divisions to participate in the western drive. But observers agree that there is no reserve of speedily available man-power for the Central Powers to draw upon that can counterbalance the khaki stream now pouring across the Atlantic from the United States. Assuming that Germany will stake everything on a decision before the Americans can arrive in sufficient force to make the odds against her overwhelming, the vital question is: What are the numbers now arrayed on each side, both on the battle-line and in reserve? While no official figures are available in answer, there is a certain amount of agreement among the estimates offered by the military critics. The key-note of General Foch's strategy, as these critics interpret it, is to oppose the masses of men hurled against his lines with the smallest force capable of sustaining the shock, thereby husbanding his reserves for the final decision. For the success of the Allies, says the expert of the New York *Times*, depends on keeping out of the fight as many divisions as possible, while forcing Germany to throw in as many as possible. According to the same authority, "Germany has now very few reserves, her well has

nearly gone dry, and she must win the war with what she already has in the field." German losses in the great drive, he says, have been variously estimated in figures ranging from 350,000 to 900,000. If we should grant the Kaiser's oratorical claim that "already 600,000 English have been put *hors de combat*," we should have to figure that the German masses thrown upon the allied guns suffered much more than the defenders, and adopt the higher estimate. The German Army to-day, according to a *Times* correspondent with our force in France, who claims that his figures are authentic, numbers approximately 5,300,000. This, we are told, does not include the Austrian Army, "which, in the calculation of military experts, is a check-off against the Italian Army." More than 3,500,000 of these German soldiers are said to be on the western front. To quote further:

"When the Kaiser started the war in August, 1914, he had an army of 2,800,000 in actual operation. One year later this army had grown to 4,800,000. By August, 1916, the German Army numbered 6,800,000. In August, 1917, the approximate size of the German Army was 6,000,000. Now it is about 700,000 fewer than that. The difference between the present size of the army and that at the high water in August, 1916, is consequently 1,500,000.

"Since August, 1916, recruits have been put in at a rate of 600,000 a year, or 900,000 in all. This indicates the German losses since August, 1916, were 2,400,000 men. The German Army's total loss in the war is placed at over 3,000,000."

An even higher estimate of the total losses of the German Army in killed and prisoners since the beginning of the war is published in *Das Neue Europa*, by Karl Bleibtren, a German statistician, who places the figure at 4,456,961. And in the New York *World* we are reminded that "the German Government stopped publishing its casualty lists last June, at which time the dead numbered 1,105,760, prisoners and missing 591,966, and the wounded 2,825,581—a total of 4,523,307."

Strange as it may seem, remarks the military expert of a New York paper, our information as to the strength of the Allies in the field is by no means as accurate as our information about the Germans. But according to André Tardieu, French High Commissioner in this country, France had an army of 3,000,000 when the German offensive began in March. It is officially admitted that the United States has more than 500,000 men in France already, and Washington dispatches say that the Administration hopes to make it 2,000,000 by the end of the year. And "through reliable channels" the news comes to Washington, according to *The Star* of that city, that Italy has recently sent nearly as many men to the French front as has this country, and that "her program calls for a duplication in numbers of all men the United States sends abroad." *The Star* goes on to say:

"In other words, by the time the United States has a million men behind the western front Italy will have a like number. Thus General Foch will have added to his army reserve 2,000,000 men, minus those he places on the actual fighting front."

Thus, without counting the great English Army, the exact size of which we do not know, the Allies would seem to have in France at this time about 4,000,000 men. Says a correspondent of the New York *Times* with the French armies.

"To one who views the situation dispassionately it seems that the trump cards—*i. e.*, the absence of the surprize element, the failure of the previous effort, German inferiority in man power and artillery, the Allies' undoubted mastery of the air, and unity of command under Foch—are all in the hand of the Allies.

"Yet Hindenburg and Ludendorff are about to take the chance. Why? There is only one answer: Because they cannot do otherwise. Despite their victories against the weaker Allies, they have failed to beat down the principal forces of their opponents. Now by dread of the future—which

can be spelled in one word, 'America'—and by difficulties at home, they are at last forced to make their final throw against odds for defeat or victory."

Addressing a labor meeting in London, Winston Churchill, British Minister of Munitions, made this informing statement:

"In the present battle the Germans are attempting to destroy armies nearly as numerous as their own and quite as well armed.

"Altho the German commanders declare their readiness to sacrifice a million men, or, if need be, a million and a half, the French and British armies will not be overcome. They will maintain a firm front throughout the summer, using their deadly weapons upon the German masses and husbanding their own strength. Meanwhile our kith and kin from the United States are coming to our aid as fast as ships can steam, our navy is coping with the submarines, and our airmen see mastery of the air in view."

From Washington comes the information that despite the brigading of our troops with those of our Allies, General Pershing will probably soon be commanding an army of Americans, French, and British. In the New York *Tribune* we read:

"As if exemplifying the unity of command and action into which the United States and its cobelligerents have entered, it became known here to-day that whenever American troops predominate in the brigaded divisions as the process goes on, these divisions, under present plans, will be turned over to General Pershing's command.

"This plan would accomplish several things which the military authorities consulting upon it regard as very desirable. It would rapidly increase the size of the American fighting command on the battle-line, it would contribute tremendously to the spirit of unity and concerted effort, and at the same time, instead of holding large numbers of American troops behind the lines while training, would surround them with seasoned veterans and under actual battle conditions school them to be rebrigaded later with fresh American troops coming to France."

But while welcoming these various indications that the odds are now in our favor, we are warned by a high officer of the Allies that "there has been no more insidious propaganda than that which tends to seduce popular opinion in the Entente countries into a false sense of security." And Earl Reading, British High Commissioner to the United States, last week assured a New York audience that "the crisis is not passed, and it never will be passed until the victory is won."—*Literary Digest*, 25/5.

UNLIMITED ARMY PROVIDED FOR BY SENATE ACTION.—The sub-committee of the Senate Military Affairs Committee, which began consideration of the $12,000,000,000 Army Appropriation Bill, to-day unanimously approved the House provision which authorizes President Wilson to call all men of draft age as rapidly as they are needed for service.

By the action of the sub-committee it is believed that the President upon passage of the appropriation bill will be empowered to increase the army by any number of men he requires. The only obstacle there is in the way of organizing an army of 5,000,000 or more will be the question of equipping it.

There is every reason to believe that arrangements have been made in the War Department to provide for the training and equipment of such an army immediately upon President Wilson receiving authorization from Congress.

The proposal of General Crowder, provost marshal, to extend the army draft to reach men from 18 to 45 years received encouragement from Senator Chamberlain, of Oregon, chairman of the committee. He declared he always advocated having the draft apply to such men.—*N. Y. Herald*, 18/6.

GERMANS AIMING TO CREATE THIRD POINT OF DANGER.—Germany's military efforts between Montdidier and Rheims have proceeded far enough to enable military service here to form a clear idea of what the enemy is trying to do.

Paris is held to be a secondary object of the present offensive. Instead, the Germans are seeking to menace Paris, which is a different thing, and has a different purpose, from trying to capture it.

Germany's object is held to be to create a third point of extreme danger, which the Allies must fortify strongly. Already the enemy had brought about such conditions at two points. One point was at Amiens, where the French have concentrated to avoid the loss of Abbeville. Another was in the Arras region, where Hazelbrouck had to be defended in order to insure the safety of the channel ports.

Now Germany seeks to create a third point of danger, Paris, and especially the rich industrial metropolitan region about Paris.

Capture Wouldn't End War.—Army officers here generally hold the opinion that the capture of Paris is not the aim or hope of the Germans in their present operations. They hold that opinion because they credit the enemy with intelligence enough to know that the capture of Paris, however desirable for its effect on the morale of their own people, would not be a decisive military victory. The French people once before had prepared to evacuate Paris, and thus the shock to them, if they had to do so now, would be discounted by that fact.

But the penetration of the allied line at Amiens, with the consequent separation of the main bodies of the allied forces, or the capture of the channel ports, and the menace to England and handicap to her transportation facilities to France, would constitute the sort of advantages which Germany would regard as decisive victories which would bring her a step nearer winning the war. And officers here state that calculations about Germany's movements should be predicated on the premise that she is exerting every effort to win the war this summer.

Must Get Close to Paris.—If the Germans really seek to bombard Paris it is believed that she will have to get within 15 miles of the city to make her bombardment effective. Despite the wide advertising of the long-range guns, a siege of a city, to constitute a real danger, would have to be conducted by artillery with a range of from 15 to 20 miles, and 10 miles would be even better.

In front of these guns the attacking force must hold a strip five or more miles wide in order to protect the guns. Otherwise a slight reverse would entail the loss of the artillery.—*Washington Evening Star,* 12/6.

FIRST TOWN CAPTURED.—The American forces captured their first town at Cantigny which they held against all counter attacks.

OUR TROOPS AT THE MARNE.—At the crest of the German drive down to the Marne, from June 1 to 6, more American troops were engaged in the allied line than ever before in France and both the official dispatches from General Pershing and the more extensive accounts sent by the correspondents at the various headquarters agree that our officers and men bore their part of the fighting with a spirit and a degree of effectiveness that well make our people proud of them. They were engaged at three different points in the sector around Chateau-Thierry: in Veuilly Wood which is northwest of that battered town on the banks of the Marne; at Jaulgonne on June 4; and at Chateau-Thierry itself, a name that hereafter will hold a distinguished place in the history of the American services since it marks the advent of our army abroad alongside of the French and British troops as holding a part of the line against the enemy in force. There were references to "divisions" in the dispatches, it is also mentioned that our

marines were brigaded with the other units of the army, and the nearest the correspondents were allowed to identifying a single unit is to be found in the statement that one of them " is a regiment which dates its history back to the revolutionary times."

The Veuilly Wood engagement began with the Germans driving our forces out of the wood in which the enemy was attempting to establish himself after occupying the village of Veuilly-la-Poterie. The enemy established a line of machine guns along the front of the wood, but before they had time to make the positions effective the American troops delivered a counter attack in the face of the machine gun fire and drove the enemy from their positions. Following this up with the bayonet they drove the Germans back through the wood to the ruined village where they were held.

On June 6 the U. S. Marines made a brilliant attack on the Germans in this same neighborhood at dawn and drove the enemy back two miles over a front of two and a half miles. The marines went into action at 3.45 a. m. and at 7.45 a. m. had won all their objectives. At five o'clock in the afternoon the enemy attacked the marines' line again and at the last reports the battle was still raging.

The Chateau-Thierry fight began on June 1, our troops having been brought from their billets by motor trucks, riding all night to get into action. The Americans were brigaded with French Colonial troops, the first unit to get into action being a machine gun unit. Chateau-Thierry stands on both banks of the Marne connected by a big bridge. Our men had no sooner reached the southern part of the town than the news was received the Germans had broken through the allied line and were in the northern part of Chateau-Thierry and were pouring through the streets to the bridge intending to take and hold not only it but the southern bank of the stream. But the Americans had by this time established their machine guns on the river bank commanding the approaches to the bridge. The accuracy of their gun-fire and the steadiness with which they maintained it brought the enemy to a standstill. On the following night they returned to the attack, covering their approach by a heavy artillery attack on the southern part of the town. In addition to this, they used smoke bombs when within machine gun range with the hope of destroying the aim of our machine gunners on the southern bank of the river. But both artillery fire and smoke bombs failed of their effect. They protected the French Colonials who were on the bridge at the northern end and covered them while they hurriedly retreated to the south bank of the river. Then as the Germans came on across the bridge the entire center span was blown up by the engineers. All the Germans who were to the south of that point were immediately captured. Moreover the intensity of the American machine gunners' fire eventually drove the Germans out of the northern part of Chateau-Thierry which, since then, has been abandoned by the enemy completely. A French staff officer called the fight at Chateau-Thierry "one of the finest feats of the war" and the Reuter correspondent at French headquarters says the work of our machine gunners at the Marne bridge is " worthy to stand with the achievements of the Americans at Cantigny."

Lieutenant John Bissell took a machine gun detachment across the river early in the engagement and joined with a French unit in the street fighting in the northern part of the town. For the greater part of the time the fighting lasted they were cut off from the bridge, and at last it became necessary to retreat across the bridge which was swept by fire from both banks. Lieutenant Bissel made his way to the northern end of the bridge, showed himself to our men on the other bank and then dashed across it, leading both his own command and 300 Frenchmen back to the main body. He has been cited for the French War Cross.—*Army and Navy Journal*, 8/6.

TABLE OF NAVAL LOSSES OF THE VARIOUS BELLIGERENTS SINCE THE OUTBREAK OF WAR

The following table is compiled from various articles appearing in the press of the several belligerent nations. These reports are so contradictory that it is impossible to furnish an absolutely correct list of vessels lost to date. In many cases the belligerent powers have failed to acknowledge the losses of the vessels. No attempt has been made to include herein a list of the various trawlers, mine-sweepers and such odd small craft which may have been destroyed while mine-sweeping or on submarine patrol duty.

(On the left margin of this table of losses is a reference to the whole number in which an account of the loss is given. A page index of these losses is given in the whole number referred to.)

(The whole number is number of the magazine issue. See cover.)

ABBREVIATIONS FOR TYPE OF VESSEL

Dreadnought battleship	d. b.	Auxiliary cruiser	ax. c.
Battleship	b.	Transport	tr.
Battle cruiser	b. c.	Minelayer	m. l.
Armored cruiser	a. c.	Coast guard	c. g.
Protected cruiser	p. c.	Hospital ship	h. s.
Cruiser	c.	Training ship	tr. s.
Light cruiser	l. c.	Patrol boat	p. b.
Gunboat	g. b.	Armed merchant vessel	a. m. v.
Torpedo gunboat	t. g.	Yacht	y.
Monitor	m.	Naval tender	n. t.
River monitor	r. m.	Fuel ship	col.
Flotilla leader	f. l.	Mine sweeper	m. s.
Destroyer	d.	Merchant vessel	m. v.
Torpedo-boat	t. b.	Submarine cruiser	sm. c.
Submarine	sm.		

LOSSES OF UNITED STATES AND HER ALLIES

UNITED STATES WARSHIP LOSSES

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	PAGE
179	Chauncey	d.	420	Sunk in collision by tr. Rose	1
179	Jacob Jones	d.	1,150	Sunk by sm., Atlantic	6
180	F-1	sm.	500	Sunk, collision	18
178	Antilles	tr.	——	Sunk by sm., Atlantic	17
184	Zaanland	tr.	8,700	Sunk by sm., Atlantic	13
185	President Lincoln	tr.	18,168	Sunk by sm., Atlantic	—
178	Alcedo	p. b.	——	Sunk by sm., Atlantic	5
177	——	p. b.	——	Foundered	4
180	—— (trawler)	p. b.	——	Foundered	14
185	Ozark	p. b.	——	Sunk in storm	—
184	Florence H.	a. m. v.	——	Destroyed by internal explosion	20
184	Lake Moor	a. m. v.	——	Sunk by sm., Atlantic	11
184	Tyler	a. m. v.	——	Sunk by sm., Mediterranean	4
183, 184	Admiral	y.	——	Foundered	25
185	Wakiva	y.	——	Sunk by collision, Atlantic	—
182	Cherokee	n. t.	——	Foundered	25
182	Mariner	n. t.	220	Foundered	3
185	William Rockefeller	col.	7,157	Sunk by sm., Atlantic	—
183	Cyclops	col.	19,000	No trace of vessel found	13

BRITISH WARSHIP LOSSES

154, 155, 156	Audacious	d. b.	23,000	Reported sunk off Irish coast. Cause unknown. British Admiralty, non-committal	27
174	Vanguard	d. b.	19,250	Internal explosion at anchor	9
155	Bulwark	b.	15,000	Internal explosion at anchor in the Thames	26
156	Formidable	b.	15,000	Sunk by German sm., North Sea	1
156	Irresistible	b.	15,000	Sunk in the Dardanelles	18
156	Ocean	b.	12,950	Sunk in the Dardanelles	18
161, 162	King Edward VII	b.	16,350	By mine, North Sea	9
158	Goliath	b.	12,950	Torpedoed in Dardanelles	19
158, 161	Triumph	b.	11,800	Sunk by sm., Dardanelles	25
158	Majestic	b.	14,900	Sunk by sm., Dardanelles	27
163, 164	Russel	b.	14,000	Sunk by mine, Mediterranean	26
168	Cornwallis	b.	14,000	Sunk by German sm. in Mediterranean	9
164	Queen Mary	b. c.	27,000	Sunk by gunfire, battle of Jutland	31
164	Indefatigable	b. c.	18,750	Sunk by gunfire, battle of Jutland	31
164	Invincible	b. c.	17,250	Sunk by gunfire, battle of Jutland	31
161, 162	Natal	a. c.	13,550	Internal explosion and sunk at anchor	30
154	Hogue	a. c.	12,000	Sunk by German sm. U-29, North Sea	22
154	Cressey	a. c.	12,000	Sunk by German sm. U-29, North Sea	22

BRITISH WARSHIP LOSSES—Continued

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
154	Aboukir	a. c.	12,000	Sunk by German sm. U-29, North Sea	22- 9-14
154, 155	Good Hope	a. c.	14,100	Sunk by German forces in Pacific	1-11-14
154, 155	Monmouth	a. c.	9,800	Sunk by German forces in Pacific	1-11-14
160	Argyll	a. c.	10,850	Ran aground, east coast of Scotland	28-10-15
164	Defense	a. c.	14,600	Sunk by gunfire, battle of Jutland	31- 5-16
164	Black Prince	a. c.	13,550	Sunk by gunfire, battle of Jutland	31- 5-16
153, 164	Warrior	a. c.	13,550	Sunk by gunfire, battle of Jutland	31- 5-16
164	Hampshire	a. c.	10,850	Sunk by mine, off Orkneys	6- 6-16
175	Ariadne	a. c.	11,000	Torpedoed	30- 7-17
177, 179	Drake	a. c.	14,100	Torpedoed, North Ireland	4-10-17
184	Thetis	c.	——	Sunk off Zeebrugge	——
184	Intrepid	c.	——	Sunk off Zeebrugge	——
184	Iphigenia	c.	——	Sunk off Zeebrugge	——
184	Sirius	c.	——	Sunk off Zeebrugge	——
184	Brilliant	c.	——	Sunk off Zeebrugge	——
184	Vindictive	c.	——	Sunk off Zeebrugge	——
154	Hawke	l. c.	7,350	Sunk by German sm. U-9, North Sea	16-10-14
153, 155	Pathfinder	l. c.	2,940	Sunk by German sm., North Sea	5- 9-14
165	Falmouth	l. c.	5,250	Sunk by German sm., North Sea	19- 8-16
165	Nottingham	l. c.	5,440	Sunk by German sm., North Sea	19- 8-16
153	Amphion	l. c.	3,360	Sunk by mine, North Sea	6- 8-14
153	Pegasus	l. c.	2,135	Sunk by German c. Koenigsberg at Zanzibar	20- 9-14
162	Arethusa	l. c.	3,750	By mine off east coast of England	14- 2-16
155	Hermes	l. c.	5,600	Sunk by German sm. U-27, North Sea	31-10-14
163	Penelope	l. c.	3,600	Reported damaged beyond repair, attack on Lowestoft	25- 4-16
167	Newcastle	l. c.	4,800	Sunk by mine, Channel	15-11-16
181	Hazard	g. b.	1,079	Sunk, English Channel	28- 1-18
153	Speedy	t. g.	810	Sunk by mine, North Sea	3- 9-14
154, 155	Niger	t. g.	810	Sunk by German sm. while at anchor	11-11-14
164	M-30	m.	——	Sunk by Turkish gunfire, Gulf of Smyrna	13- 5-16
164	Tipperary	f. l.	1,850	Sunk by gunfire, battle of Jutland	31- 5-16
164	Turbulent	f. l.	1,850	Sunk by gunfire, battle of Jutland	31- 5-16
	Bullfinch	d.	370	Sunk in collision with Dutch merchant ship	18- 8-14
	——	d.	——	Ran ashore, Scotch coast	27-12-14
	Erne	d.	550	Wrecked in a storm	- 2-15
157, 158	Recruit	d.	385	Sunk by German sm., North Sea	1- 5-15
157, 158	Maori	d.	1,035	Blown up by mine off Belgian coast	7- 5-15
159	Lynx	d.	935	Sunk by mine	10- 8-15
161	Louis	d.	965	Wrecked, Eastern Mediterranean	10-11-15
162	Coquette	d.	365	Sunk by mine, North Sea	?- 3-16
164	Fortune	d.	920	Sunk by gunfire, battle of Jutland	31- 5-16
164	Sparrowhawk	d.	950	Sunk by gunfire, battle of Jutland	31- 5-16
164	Ardent	d.	950	Sunk by gunfire, battle of Jutland	31- 5-16
164	Shark	d.	950	Sunk by gunfire, battle of Jutland	31- 5-16
164	Eden	d.	555	Sunk after collision, English Channel	16- 6-16
164	Nomad	d.	1,200	Sunk by gunfire, battle of Jutland	31- 5-16
164	Nestor	d.	1,200	Sunk by gunfire, battle of Jutland	31- 5-16
165	Lassoo	d.	1,500	Sunk, mine or torpedo, North Sea	13- 8-16
	Medusa	d.	——	Left after collision. Found by Dutch trawler, towed towards Holland, sunk in Dutch waters	——
166	Flirt	d.	360	Sunk by gunfire of German d	26-10-16
166	Nubian	d.	985	Torpedoed by German d. and ran aground	26-10-16
168	——	d.	——	Collision	21-12-16
168	——	d.	——	Collision	21-12-16
169	——	d.	——	Destroyed by mine	8- 2-17
169	——	d.	——	Damaged by torpedo from German d. and sunk by own crew	1-23-17
170	——	d.	——	Destroyed by mine	1- 3-17
174	——	d.	——	Sunk by mine, North Sea	4- 7-17
174	——	d.	——	Sunk by sm., North Sea	7- 6-17
175	——	d.	——	Sunk by mine, North Sea	15- 8-17
177	——	d.	——	Sunk by sm., Channel	24- 9-17
178	——	d.	——	Sunk in collision	19-10-17
178, 170	Mary Rose	d.	——	Sunk by gunfire, North Sea	17-10-17
178, 179	Strongbow	d.	——	Sunk by gunfire, North Sea	17-10-17
179	——	d.	——	Sunk by sm., Mediterranean	17
179	——	d.	——	Sunk by gunfire, North Sea	-12-17
179	Partridge	d.	——	Collision	15-12-17
180	—— (three)	d.	——	Sunk by mines or torpedoes off Dutch coast	22-12-17

BRITISH WARSHIP LOSSES—Continued

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
180	Racoon	d.	915	Sunk on rocks, Irish coast	9-1-18
180	——	d.	——	Torpedoed, Mediterranean	7-1-18
180	—— (two)	d.	——	Foundered in gale, Scotch coast	12-1-18
183	H. M. Boxer	d.	——	Sunk, result of collision	8-2-18
183	——	d.	——	Sunk in collision	23-3-18
183	——	d.	——	Sunk, struck mine	27-3-18
183	——	d.	——	Sunk, collision	1-4-18
183	——	d.	——	Sunk, collision	4-4-18
185	Cowslip	d.	——	Sunk by sm., North Sea	25-4-18
185	——	d.	——	Sunk by sm.	14-5-18
171	——	d.	——	Sunk by torpedo, North Sea	18-3-17
171	——	d.	——	By mine, Straits of Dover	27-3-17
171	——	d.	——	Collision	27-3-17
172	——	d.	——	By mine, Channel	2-5-17
173	——	d.	——	Collision	29-5-17
158	No. 10	t. b.	244	Sunk by German sm., North Sea	10-6-15
158	No. 12	t. b.	253	Sunk by German sm., North Sea	10-6-15
160	No. 96	t. b.	130	Sank after collision with merchantman, Straits of Gibraltar	1-11-15
162	No. 11	t. b.	253	Sunk by mine, North Sea	2-3-16
185	——	t. b.	——	Collision, Channel	10-4-18
185	No. 90	t. b.	——	Foundered	25-4-18
153	AE-1	sm.	725-810	Accidentally sunk off Australian coast	14-9-14
154	E-3	sm.	725-810	Rammed and sunk by German vessel	18-10-14
154, 155	D-5	sm.	550-600	Sunk by German mine, North Sea	3-11-14
	D-2	sm.	550-600	Reported lost. Details not known	1-12-14
	E-10	sm.	725-810	Missing, North Sea	——
157	E-15	sm.	725-810	Ran aground in the Dardanelles and destroyed by own picket boats	18-4-15
162	H-6	sm.	375-450	Stranded, Dutch coast, rescued and interned	20-1-16
162	E-17	sm.	725-810	Reported as sunk off Holland	6-1-16
159, 160	AE-2	sm.	725-810	Sunk, Sea of Marmora	30-4-15
	E-13	sm.	725-810	Sunk by German torpedo craft off Danish coast	19-8-15
160	E-7	sm.	725-810	Sunk at Dardanelles	4-9-15
160, 161	E-20	sm.	——	Announced as sunk by Turks in Dardanelles	5-11-15
163	E-22	sm.	——	Sunk off Holland	25-5-16
175	C-34	sm.	——	Sunk by sm.	25-7-17
182	E-14	sm.	——	Sunk off Kum Kale	4-2-18
185	—— (seven)	sm.	——	Destroyed to prevent capture, Baltic	4-18
154	Oceanic	ax. c.	17,274	Ran aground off north coast of Scotland in storm	8-9-14
162, 163	Alcantara	ax. c.	15,300	Sunk in battle, North Sea	29-2-16
	Rohilla	ax. c.	7,400	Ran aground off Whitby, completely wrecked	30-10-14
156	Viknor	ax. c.	5,386	Lost off Irish coast	14-1-15
	Clan Macnaughton	ax. c.	4,985	Lost in a gale	3-2-15
157	Bayano	ax. c.	5,948	Probably torpedoed by German sm. in Irish Sea	12-3-15
159	Ramsey	ax. c.	——	Sunk by German ax. c. Meteor, North Sea	8-8-15
159	India	ax. c.	7,900	Sunk by German sm., North Sea	10-8-15
169	Laurentic	ax. c.	14,900	Destroyed by mine	31-1-17
173	Avenger	ax. c.	——	Torpedoed, North Sea	13-6-17
173	Hilary	ax. c.	——	Torpedoed, North Sea	5-17
175	Otway	ax. c.	——	Torpedoed	22-7-17
178, 179	Orama	ax. c.	12,927	Torpedoed	19-10-17
179	Champagne	ax. c.	——	Torpedoed	15-10-17
181	Aragon	ax. c.	9,588	Sunk, Mediterranean	31-1-18
181	Osmanieh	ax. c.	4,041	Sunk, Mediterranean	31-1-18
182	Calgarian	ax. c.	17,515	Sunk off Irish coast	1-3-18
159	Royal Edward	tr.	11,117	Sunk by sm., Ægean Sea	14-8-15
160	Marquette	tr.	7,057	Sunk by German sm., Ægean Sea	26-10-15
160	Ramazan	tr.	3,477	Sunk by German sm., Ægean Sea	17-9-15
161	Woodfield	tr.	3,584	Sunk off coast of Morocco	30-11-15
166	Franconia	tr.	18,000	Torpedoed by German sm.	4-10-16
168	Russian	tr.	——	Sunk by German sm. in Mediterranean	11-12-16
168	Ivernia	tr.	14,000	Sunk by German sm. in Mediterranean	1-1-17
174	Armadale	tr.	6,153	Sunk by sm., Atlantic	27-6-17
173	Cameronia	tr.	10,960	Torpedoed, Mediterranean	15-4-17
173	Transylvania	tr.	——	Torpedoed, Mediterranean	4-5-17
181	Tuscania	tr.	——	Sunk by German sm.	9-2-18
185	Moldavia	tr.	9,500	Sunk by sm., Channel	23-5-18
185	Leasowe	tr.	9,737	Sunk by sm., Mediterranean	26-5-18
185	Ansonia	tr.	8,153	Sunk by sm., Atlantic	5-18

BRITISH WARSHIP LOSSES—Continued

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
	Hythe	aux.	201	Collision, Ægean	29-10-15
158	Princess Irene	m. l.	——	Internal explosion off Sheerness	27- 5-15
163	Medusa	m. l.	2,800	Collision	- 3-16
161	Abbas	c. g.	298	Sunk by German sm. off Sollum Harbor, Egypt	6-11-15
161	Abdel Monaym	c. g.	598	Sunk by German sm. off Sollum Harbor.	6-11-15
161	Anglia	h. s.	1,862	Sunk by mine, English Channel	17-11-15
167	Brittanic	h. s.	——	Mine or sm. in Ægean Sea	22-11-16
180	Rewa	h. s.	7,308	Torpedoed and sunk in Bristol Channel.	4- 1-18
182	Glen Castle	h. s.	——	Sunk, British Channel	26 -2-18
	Fishguard II	tr. s.	——	Foundered in gale, North Sea	17- 9-14
185	——	p. b.	——	Sunk by sm., Channel	5- 6-18
160, 161	Tara	p. b.	6,322	Sunk by German sm., Mediterranean	5-11-15
165	Duke of Albany	a. m. v.	1,977	Sunk by German sm., North Sea	24- 8-16
185	Patia	a. m. v.	6,103	Sunk by sm., Atlantic	13- 6-18
161	Aries	y.	——		15
161	Irene	y.	——		15
168	Ben-my-Chree	n. t.	——	Sunk by gunfire, Kastelorizo Harbor, Asia Minor	11- 1-17
171	Asturias	h.	——	Torpedoed	20- 3-17
172	Donegal	h.	——	Torpedoed	4-17-17
172	Lanfranc	h.	——	Torpedoed	4-17-17
172	Gloucester Castle	h.	——	Torpedoed	30- 3-17
173	Dover Castle	h.	——	Torpedoed, Mediterranean	26- 5-17
179	——	m.	——	Sunk by sm., Mediterranean	17
181	Raglan	m.	4,500	Action between British and Turkish, Dardanelles	20- 1-18
181	M-28	m.	500	Dardanelles	20- 1-18
183	——	m. s.	——	Sunk by mine	25- 8-18
185	——	m. s.	——	Sunk by sm., Channel	6- 5-18

FRENCH WARSHIP LOSSES

171	Danton	d. b.	18,400	Torpedoed, Mediterranean	19- 3-17
156	Bouvet	b.	12,007	Sunk at the Dardanelles	18- 3-15
167, 168	Suffren	b.	12,750	Sunk by German sm. off Lisbon	26-11-16
157	Leon Gambetta	a. c.	12,352	Torpedoed by Austrian sm., Straits of Otranto	26- 4-15
174	Kleber	a. c.	7,578	Sunk by torpedo, Pt. St. Mathieu	29- 6-17
168	Gaulois	a. c.	11,260	Sunk by German sm. in Mediterranean.	27-12-16
180	Chateau Renault	p. c.	7,808	Sunk by sm., Ionian Sea	14-12-17
162	Amiral Charnier	c.	4,702	Torpedoed, Mediterranean	8- 2-16
	Zelée	g. b.	636	Sunk by German cruisers at Tahiti	28-10-14
167	Surprise	g. b.	636	Sunk by sm. gunfire at Funchal	-12-16
156	Mousquet	d.	298	Sunk by Emden at Penang	28-10-14
156	Dague	d.	720	Sunk by Austrian mine off Antivari	24- 2-15
	Branlebas	d.	330	Sunk by mine	——
162	Renaudin	d.	756	Torpedoed, Adriatic	18- 3-16
164	Fourche	d.	845	Sunk by Austrian sm., St. of Otranto	26?-6-16
164	Fantassin	d.	453	Sunk incident to collision	- 6-16
170	Cassini	d.	——	Sunk by German sm. in Mediterranean.	28- 2-17
171	Cassini	d.	——	Torpedoed, Mediterranean	28- 2-17
173	Boutefen	d.	703	By mine, North Sea	20- 5-17
	No. 347	t. b.	97	Sunk in collision with each other	9-10-14
	No. 338	t. b.	97		
	——	t. b.	——	Reported lost	- 1-15
	No. 331	t. b.	97	Sunk in collision off Cherbourg	16- 6-15
	No. 219	t. b.	87	Sunk off Nieuport	- 1-15
172	——	t. b.	——	By gunfire, North Sea	25- 4-17
155	Curie	sm.	398-550	Sunk by Austrians at Pola	23-12-14
156	Saphir	sm.	386-450	Sunk at the Dardanelles	17- 1-15
	Joule	sm.	398-550	Mined, Dardanelles	1- 5-15
	Calypso	sm.	345-490	Rammed and sunk during maneuvers off Cape Lardier	8- 7-15
161	Monge	sm.	392-550	Sunk by Austrians, Adriatic	28-12-15
159	Mariotte	sm.	522-615	Sunk at the Dardanelles	26- 7-15
160	Turquoise	sm.	386-450	Injured by gunfire, Sea of Marmora. Refloated by Turks and renamed Ahmed	3-11-15
161	Fresnel	sm.	398-550	Sunk in the Adriatic by an Austrian ship	5-12-15
166	Faucault	sm.	390	Destroyed by Austrian seaplanes	- 9-16
174	Ariane	sm.	——	Sunk by sm., Mediterranean	19- 6-17
185	Diani	sm.	——	Overdue	- 5-18
185	Prairial	sm.	——	Sunk in collision	——

FRENCH WARSHIP LOSSES—Continued

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS
162	Provence	ax. c.	18,400	Torpedoed, Mediterranean
	Indien	ax. c.	800	Sunk by sm. off Rhodes
	Calvados	tr.	6,008	Sm., Mediterranean
167	Karnak	tr.	6,800	German sm., Mediterranean
166	Gallia	tr.	15,000	Sunk by sm
168	Magellan	tr.	6,000	Sunk by German sm. in Mediterranean
169	Amiral Magon	tr.	——	Sunk by German sm. in Mediterranean
158, 159	Casa Bianca	m. l.	945	Sunk in the Ægean Sea by a mine

RUSSIAN WARSHIP LOSSES

166, 167	Imperatrista Maria	d. b.	22,500	Sunk by mine or internal explosion
180	Slava	d. b.	——	Sunk
165	Peresviet	b.	12,764	Wrecked near Vladivostock
177, 178	Slava	b.	——	Sunk by gunfire, Baltic
	Pallada	a. c.	7,775	Sunk by German sm., Baltic
183	Admiral Makaroff	p. c.	7,775	Sunk by mine
155, 156	Jemtchug	c.	3,130	Sunk by Emden, Penang
	Kubanez	g. b.	1,280	Reported by Turks sunk by Turkish d.
159	Sivutch	g. b.	875	Sunk by Germans, Baltic Sea
175	Lt. Bourakoff	d.		Sunk by mine, Baltic
177	Ochotnik	d.	615	Sunk by mine, Baltic
177, 178	Grom	d.	1,100	Sunk by gunfire, Baltic
162	Leit Pushtscheen	t. b.	350	Sunk by German sm. near Varna
	Putschino	t. b.	——	By gunfire
174	——	t. b.	——	Sunk by mine, Black Sea
185	—— (four)	sm.	——	Destroyed to prevent capture
155	Prut	ax. c.	5,440	Scuttled to avoid capture
	Riasan	tr.	3,522	Captured by Emden
182	——	tr.	——	Sunk by destroyer
182	——	tr.	——	Sunk by destroyer
158	Yenisei	m. l.	2,926	Sunk by German sm., Baltic
	Oleg	m. l.	1,125	Sunk, Black Sea
	Athos	m. l.	1,743	Sunk, Black Sea
163	Portugal	h. s.	——	Torpedoed by German sm
185	Black Sea Fleet Surrendered to Germans (Unofficial)			

JAPANESE WARSHIP LOSSES

168	Tsukuba	a. c.	13,750	Internal explosion
	Shirotaye	d.	380	Ran ashore, Tsing Tao
	No. 33	t. b.	82	Sunk by mines while mine-sweeping off Tsing Tao
	Name unknown	t. b.	——	By mine
167	No. 4	sm.	125	Internal explosion
154	Takachiho	p. c.	3,700	Torpedoed by German d., S-90, off Tsing Tao

In addition to the above, five special service ships were sunk during the operations off Tsing Tao.

ITALIAN WARSHIP LOSSES

165	Leonardo da Vinci	d. b.	22,340	Caught fire and blew up, Taranto harbor
160	Benedetto Brin	b.	13,215	Sunk by internal explosion
169	Regina Margherita	b.	13,214	Sunk by mine
158	Amalfi	a. c.	9,958	Sunk by Austrian sm., Adriatic
158	Garibaldi	a. c.	7,234	Torpedoed off Ragusa, Austrian sm.
158	Turbine	d.	325	Scuttled to avoid capture after engagement with Austrian vessels, Adriatic
161	Intrepido	d.	680	Sunk by mine, Adriatic
165	Impetuoso	d.	650	Sunk, Austrian sm., Otranto Straits
168	——	d.	——	Sunk off Corfu
164	Citta di Messina	ax. c.	3,495	Sunk by Austrian sm., St. of Otranto
176	Umberto	ax. c.	——	Sunk by mine, Mediterranean
	5-PN	t. b.	118	Torpedoed by Austrian sm. off Venice
	17-OS	t. b.	118	Sunk by own mine while mine-laying off Salvore
158	Medusa	sm.	241-295	Torpedoed and sunk, Austrian sm.
	Nereide	sm.	221-315	Sunk by Austrian sm., Adriatic
165	Giacinto Pullino	sm.	400	Captured by Austria
165	——	sm.	——	Reported missing
161	Re Umberto	tr.	——	Sunk by mine, Adriatic
170	Minas	tr.	2,854	Sunk by German sm. in Mediterranean

GRECIAN WARSHIP LOSSES

174	Doxa	d.	——	Sunk by explosion, Mediterranean

LOSSES OF GERMANY AND HER ALLIES

GERMAN WARSHIP LOSSES

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
164	Pommern	b.	13,040	Sunk by gunfire, battle of Jutland	31- 5-16
164	Lutzow	b. c.	28,000	Sunk by gunfire, battle of Jutland	1- 6-16
155	Yorck	a. c.	9,350	Sunk by German mine near Wilhelmshaven	3-11-14
155, 156, 158	Scharnhorst	a. c.	11,420	Sunk by English forces off Falklands	8-12-14
155, 156, 158	Gneisenau	a. c.	11,420	Sunk by English forces off Falklands	8-12-14
155	Friederich Karl	a. c.	8,858	No official report. Press reports that she was lost in the Baltic	12-14
156, 163	Bluecher	a. c.	15,550	Sunk by British forces off Doggerbank	24- 1-15
160	Prinz Adalbert	a. c.	8,858	Sunk by British sm. in Baltic	23-10-15
153, 154	Mainz	p. c.	4,280	Sunk by British forces, North Sea	28- 8-14
153, 154	Koeln	p. c.	4,280	Sunk by British forces, North Sea	28- 8-14
153, 154	Ariadne	p. c.	2,618	Sunk by British forces, North Sea	28- 8-14
154, 155	Hela	p. c.	2,003	Sunk by British sm. E-9, North Sea	13- 9-14
153	Augsburg	p. c.	4,280	By gunfire	7- 8-14
154, 155, 156, 163, 164	Emden	p. c.	3,592	Sunk by Australian c. Sydney, Indian Ocean	9-11-14
154, 155, 156, 160	Leipzig	p. c.	3,200	Sunk by English forces off Falklands	8-12-14
155, 156, 158	Nurnberg	p. c.	3,396	Sunk by English forces off Falklands	8-12-14
158	Dresden	p. c.	3,592	Sunk by British cruisers in Pacific	14- 3-15
155, 156, 158, 162	Koenigsberg	p. c.	3,340	Sunk by English forces in Rufiji River	11- 7-15
161	Bremen	p. c.	3,300	Sunk by sm. in the Baltic	17-12-15
179	Karlsruhe	p. c.	——	Sunk by internal explosion	4-11-14
159	—— (two)	l. c.	——	Gulf of Riga	17- 8-15
153	Magdeburg	l. c.	4,478	Ran ashore in fog in Baltic; blown up by own crew after engagement with Russians	27- 8-14
155	Geier	l. c.	1,630	Interned in Honolulu	8-11-14
160, 161	Undine	l. c.	2,672	Sunk by British sm. in the Baltic	7-11-15
162	Karlsruhe	l. c.	4,822	Press reports state she was blown up by internal explosion while cruising in the Atlantic	4-11-14
164	Elbing	l. c.	5,000	Sunk by gunfire, battle of Jutland	1- 6-16
164	Weisbaden	l. c.	5,000	Sunk by gunfire, battle of Jutland	1- 6-16
164	Rostock	l. c.	4,820	Sunk by gunfire, battle of Jutland	1- 6-16
164	Frauenlob	l. c.	2,650	Sunk by gunfire, battle of Jutland	1- 6-16
	Moewe	g. b.	640	Sunk by her own crew at Dar-es-Salam when English vessels appeared	14- 8-14
	Wissman	g. b.	about 300	Captured by English on Lake Nyasa	20- 8-14
	Planet	g. b.	640	Sunk by her own crew at Yap Island on approach of Japanese fleet	7-10-14
155	Cormoran	g. b.	1,604	Sunk by Germans in Kiao-Chau Bay before surrendering Tsing-Tao to Allies.	6-11-14
155	Iltis	g. b.	886	Sunk by Germans in Kiao-Chau Bay before surrendering Tsing-Tao to Allies.	6-11-14
155	Tiger	g. b.	886	Sunk by Germans in Kiao-Chau Bay before surrendering Tsing-Tao to Allies.	6-11-14
155	Luchs	g. b.	886	Sunk by Germans in Kiao-Chau Bay before surrendering Tsing-Tao to Allies.	6-11-14
155	Jaguar	g. b.	886	Sunk by Germans in Kiao-Chau Bay before surrendering Tsing-Tao to Allies.	6-11-14
	Tsing-tau	g. b.	168	Interned, China	17- 8-14
	Vaterland	g. b.	168	Interned, China	17- 8-14
178	Eber	g. b.	984	Sunk by Germans, Bahia	27-10-17
154	V-187	d.	689	Sunk by British forces, North Sea	28- 8-14
154	S-115	d.	413	Sunk by English destroyers, North Sea.	17-10-14
154	S-117	d.	413	Sunk by English destroyers, North Sea.	17-10-14
154	S-118	d.	413	Sunk by English destroyers, North Sea.	17-10-14
154	S-119	d.	413	Sunk by English destroyers, North Sea.	17-10-14
154, 162	S-90	d.	396	Driven ashore and wrecked by own crew off Tsing-Tao after having torpedoed the Japanese ship Takachiho	20-10-14
155	Taku	d.	276	Sunk by Germans in Kiao-Chau Bay before surrendering Tsing-Tao to Allies.	6-11-14
155	S-124	d.	463	Accidentally rammed and sunk by a merchant vessel in Baltic	22-11-14
	V-186	d.	750	By gunfire	—— ——
	S-106	d.	400	By gunfire	—— ——
154	S-126	d.	487	By sm.	6-10-14
159	G-196	d.	689	Sunk by British sm., North Sea	26- 7-15
159	——	d.	——	Announced by France as sunk by two French torpedo-boats off Belgian coast.	22- 8-15
	——	d.	——	Reported sunk by Russians in Baltic	19- 8-15

GERMAN WARSHIP LOSSES—Continued

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS
——	.....	d.	——	Reported sunk by British sm. E-19 between Denmark and Sweden. Not confirmed
	S-116	d.	447	Sunk by English sm. E-9, North Sea
164	—— (five)	d.	——	Sunk by gunfire, battle of Jutland
169	——	d.	——	Reported sunk in engagement with British destroyers
174	——	d.	——	Sunk by mine, North Sea
177	——	d.	——	Sunk by gunfire, Baltic
177	——	d.	——	Sunk by gunfire, Baltic
179	——	d.	——	Sunk by mine, North Sea
181	A-73	d.	——	Sunk by mine
181	A-79	d.	——	Sunk by mine
183	——	d.	——	Sunk by shots from Morris
183	——	d.	——	Sunk in action off Dunkirk
185	—— (two)	d.	——	Sunk by sm.
171	——	d.	——	By gunfire, North Sea
172	G-42	d.	——	By gunfire, North Sea
172	G-85	d.	——	By gunfire, North Sea
172	——	d.	——	Mine or torpedo, North Sea
173	S-20	d.	——	By gunfire, North Sea
	A-2	t. b.	about 150	Sunk by British destroyers, North Sea
	A-6	t. b.	about 150	Sunk by British destroyers, North Sea
	——	t. b.	——	Officially announced by Russia, blown up by mine
	——	t. b.	——	Announced by German Admiralty, sunk by mines, Baltic
	——	t. b.	——	Announced by German Admiralty, sunk by mines, Baltic
	——	t. b.	——	Sunk by sm., Baltic
159	—— (eight)	t. b.	——	Gulf of Riga
	——	t. b.	——	Collision, Baltic
176	——	t. b.	——	Sunk by gunfire, Moon Sound
176	——	t. b.	——	Sunk by gunfire, Moon Sound
176	——	t. b.	——	Sunk by gunfire, Moon Sound
176	——	t. b.	——	Sunk by gunfire, Moon Sound
176	——	t. b.	——	Sunk by gunfire, Moon Sound
176	——	t. b.	——	Sunk by gunfire, Moon Sound
183	——	t. b. ...	——	Sunk in action off Dunkirk
183	——	t. b. ...	——	Sunk in action off Dunkirk
153	U-15	sm.	about 450	Sunk by British c. Birmingham
155	U-18	sm.	about 450	Destroyed by English d. Garry off Scotch coast
160, 161	U-8	sm.	246-295	Sunk by British destroyers
	U-51	sm.	——	Sunk, Black Sea
	U-12	sm.	246-295	Rammed and sunk by British d. Ariel
157	U-29	sm.	840-980	Announced sunk by British. Loss admitted by German Admiralty
	U-14	sm.	about 500	Sunk by British forces
159	U-27	sm.	840-890	Announced by German Admiralty as missing
	U-8 (new)	sm.	900	Sunk by British
156	U-3	sm.	255	Rammed
166	U-41	sm.	——	Sunk by gunfire
166	U-20	sm.	——	Accidentally grounded and destroyed by crew
165	UC-5	sm.	200	Captured by British p. b.
167	——	sm.	——	Captured by British in Mediterranean
169	——	sm.	——	Foundered off Norwegian coast
174	——	sm.	——	Ran on rocks, Sunderland, Eng.
175	——	sm.	——	Sunk by depth charge, Atlantic
175	UB-23	sm.	——	Interned, Ferrol, Spain
175	——	sm.	——	Rammed by merchantman
175	——	sm.	——	Sunk by a. m. v., Atlantic
175	——	sm.	——	Sunk by a. m. v., Atlantic
175	——	sm.	——	Sunk by sailing vessel
175	——	sm.	——	Ran ashore, French coast
175	——	sm.	——	Sunk by Russian d. Lovky
175	——	sm.	——	Sunk by a. m. v., Mediterranean
176	——	sm.	——	Sunk by a bomb, a. m. v.
176	——	sm.	——	Sunk by a. m. v., Atlantic
176	——	sm.	——	Sunk by a. m. v., Atlantic
176	——	sm.	——	Sunk by gunfire
176	——	sm.	——	Sunk by depth bomb
176	——	sm.	——	Sunk by sm.
176	——	sm.	——	Sunk by seaplane
176	——	sm.	——	Sunk by depth charge

GERMAN WARSHIP LOSSES—Continued

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
176	——	sm.	——	Sunk by gunfire	17
176	——	sm.	——	Sunk by a. m. v.	17
176	——	sm.	——	Sunk by a. m. v.	17
177	——	sm.	——	Bombed by seaplane	17
177	——	sm.	——	Bombed by seaplane	17
177	——	sm.	——	Sunk by British d., North Sea	17
177	——	sm.	——	Rammed by British d.	17
177	——	sm.	——	Sunk by merchantman	12- 6-17
177	——	sm.	——	Sunk by French Navy, Med.	- 9-17
177	——	sm.	——	Sunk by French Navy, Med.	- 9-17
178	——	sm.	——	Sunk by p. b., North Sea	-11-17
178	——	sm.	——	Sunk by d., North Sea	-11-17
179	——	sm.	——	Sunk by bombs by airship	17
179	——	sm.	——	Sunk by bombs by airship	17
179	——	sm.	——	Rammed by p. b.	17
179	——	sm.	——	Sunk by bombs by airship	17
179	——	sm.	——	Sunk by depth bomb, U. S. d.	17
179	——	sm.	——	Sunk by gunfire, Mediterranean	17
171	U-30	sm.	350	Interned, Holland	23- 2-17
172	B-6	sm.	——	Interned, Holland	13- 3-17
172	UC-39	sm.	——	Sunk, North Sea	- 4-17
173	——	sm.	——	Torpedoed, Mediterranean	2- 6-17
180	U-53	sm.	——	Captured	——
180	——	sm.	——	Fire from American passenger ship	27-12-17
180	——	sm.	——	Sunk by American destroyer	——
182	——	sm.	——	Sunk by gunfire from Paulsboro	1- 3-18
182	——	——	——	——	——
182	——	sm.	——	Sunk, Mediterranean	18- 1-18
183	——	sm.	——	Sunk by U. S. destroyers	30- 3-18
183	——	sm.	——	Sunk by U. S. destroyers	30- 3-18
183	——	sm.	——	Sunk	——
183	——	sm.	——	Sunk	——
183	——	sm.	——	Sunk off coast of France	——
183	V-48	sm.	——	Interned	25- 3-18
183	——	sm.	——	Sunk, Bristol Channel	24- 2-18
183	——	sm.	——	Sunk	30-10-17
183	——	sm.	——	Sunk	15- 3-18
183	——	sm.	——	Sunk by seaplane	——
183	——	sm.	——	Sunk by seaplane	——
183	——	sm.	——	Sunk by seaplane	——
183	——	sm.	——	Sunk by seaplane	——
183	——	sm.	——	Sunk by seaplane	6- 4-18
183	——	sm.	——	Sunk by seaplane	6- 4-18
183	——	sm.	——	Sunk by seaplane	6- 4-18
183	——	sm.	——	Sunk by seaplane	6- 4-18
183	——	sm.	——	Sunk by seaplane	6- 4-18
183	——	sm.	——	Sunk by seaplane	6- 4-18
183	——	sm.	——	Sunk by airship	6- 4-18
183	——	sm.	——	Sunk by airship	6- 4-18
184	——	sm.	——	Sunk by gunfire	15- 4-18
184	(ten)	sm.	——	Sunk by airplanes	——
184	(three)	sm.	——	Sunk by p. b. and d.	——
185	——	sm.	——	Sunk by British a. m. v.	- 4-18
185	——	sm. cr.	——	Sunk by British sm.	11- 5-18
185	——	sm.	——	Rammed by English tr.	15- 5-18
185	——	sm.	——	Rammed by English tr.	15- 5-18
185	——	sm.	——	Sunk by American d.	20- 5-18
185	——	sm.	——	Sunk by American d.	20- 5-18
185	——	sm.	——	Sunk by American d.	27- 5-18
185	UC-39	sm.	——	Sunk by depth charge and gunfire from British d.	15- 5-18
185	——	sm.	——	Sunk by depth charge from towed balloon	——
185	——	sm.	——	Sunk by depth charge from dirigible	——
185	——	sm.	——	Sunk by depth charge from seaplane	——
185	——	sm.	——	Sung by bomb from seaplane	——
185	——	sm.	——	Mined	——
185	U-39	sm.	——	Entered Spanish port, damaged after encounter with airplane	20- 5-18
185	U-65	sm.	——	Entered Spanish port	——
185	(twenty-eight)	sm.	——	——	——
185	——	sm.	——	Sunk by sm.	——
	Friedrich	ax. c.	8,865	Interned, Norfolk	7- 4-15
157	Kronprinz Wilhelm	ax. c.	14,705	Interned, Norfolk	29- 4-15
153	Berlin	ax. c.	17,324	Interned, Norway	16-11-14
	Patagonia	ax. c.	——	Seized by Argentina, violation of neutrality	16-11-14

GERMAN WARSHIP LOSSES—Continued

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
	Eber	ax. c.	1,000	Interned, Bahia	
161	Kormoran II	ax. c.	3,508	Interned, Guam	
	Prince Adalbert	ax. c.	6,030	Captured by British c.	
	Sudmark	ax. c.	5,113	Captured by British c.	
153	Kaiser Wilhelm der Grosse	ax. c.	13,952	Sunk by British c. Highflyer	
	Bethania	ax. c.	7,548	Captured by British c.	
	Spreewald	ax. c.	3,899	Captured by British c.	
153	Cap Trafalgar	ax. c.	18,710	Sunk by British ax. c. Carmania	
	Max Brock	ax. c.	4,579	Captured by British c.	
	Graecia	ax. c.	2,753	Captured by English c.	
	Markomannia	ax. c.	4,505	Sunk by British c. in Indian Ocean	
	Navarra	ax. c.	5,794	Sunk by English ax. c. in Atlantic	
	Eleonore Woermann	ax. c.	4,624	Sunk by Australian c. Australia	
158	Macedonia	ax. c.	4,347	Captured	
162	Greif	ax. c.	1,165	Sunk in battle, North Sea	
	Karnac	ax. tr.	4,437	Interned, Chile	
164	Hermann	ax. c.	3,000	Sunk by Russian destroyers	
179	Marie	ax. c.	3,000	Sunk by gunfire, Cattegat	
179	Botnia	ax. c.	——	Sunk by mine	
171	Cormoran	ax. c.	——	Blown up, Guam	
185	——	ax. c.	——	Sunk by sm.	
183	Frankland	tr.	——	Struck mine at Noosland and sunk	
183	——	tr.	——	Sunk by mine	
153	Königin Luise	m. l.	2,163	Sunk by English d., North Sea	
158, 159	Albatross	m. l.	2,165	Sunk by Russians in Baltic. Reported raised and interned in Sweden	
159	Meteor	m. l.	3,613	Sunk by own crew after attempting to escape British forces, North Sea	
	UC-8	m. m. l.	160-180	Interned in Holland	
	Kingani	a. m. v.	——	Captured by the British on Lake Tanganyika	
	Locksun	n. t.	1,020	Interned, Honolulu	
184	—— (ten)	m. s.	——	Sunk by gunfire	
182	Igotz Mendi	m. v.	4,648	Captured by the Wolf and run aground off Denmark	
182	Turritella	m. v.	——	Captured by Germans, outfitted as mine layer; later sunk by British	
158	Ophelia	——	1,153	Captured by English c., North Sea. English claim vessel an ax. c., while Germany claims her a hospital ship	

In addition to the above, there seems to be no doubt that a great number of German submarines have been destroyed around the British Isles and possibly also in the Mediterranean and near the Dardanelles.

AUSTRIAN WARSHIP LOSSES

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
185	Szent Istvan	d. b.	20,000	Torpedoed and sunk	
179	Wien	b.	5,600	Sunk by Italian d.	
173	——	b.	——	By gunfire, Adriatic	
180	Wein	b.	——	Sunk	
184	Viribus Unitis	b.	——	——	
153	Zenta	c.	2,264	Sunk by French fleet off Antivari	
155, 162	Kaiserin Elizabeth	c.	3,937	Sunk by her own crew at Tsing-Tao	
161	—— (Novara type)	c.	3,384	Torpedoed	
	——	g. b.	——	Sunk, Adriatic	
	Temes	r. m.	433	Struck a mine and sank off Shabatz	
161	Triglav	d.	787	Sunk by gunfire in Adriatic	
161	Lika	d.	787	Sunk by mine in Adriatic	
177	——	d.	——	Captured by Italian d., Adriatic	
180	No. 11	d.	——	Captured	
153	No. 19	t. b.	78	Struck by a mine and sank at entrance to Pola	
	——	t. b.	——	Sunk by mine in Adriatic	
	——	t. b.	——	Sunk by mine in Adriatic	
178	No. 11	t. b.	110	Surrendered voluntarily	
184	——	t. b.	——	——	
	——	t. b.	——	Sunk by British airplane	
	——	sm.	——	Sunk by an Italian d.	
	U-18	sm.	685-860	Reported by France sunk by a French aeroplane, Adriatic	
159	U-12	sm.	——	Torpedoed and sunk by an Italian sm., upper Adriatic	
159	U-3	sm.	233-295	Sunk by French d. Bisson	
	——	sm.	——	Gunfire, French fleet	
	U-11	sm.	860	Sunk by aeroplane	

AUSTRIAN WARSHIP LOSSES—Continued

WHOLE NUMBER	NAME	TYPE	TONNAGE	REMARKS	DATE
168	VT-12	sm.	——	Captured by Italy	- 1-17
168	VC-12	sm.	——	Captured by Italy	- 1-17
176	——	sm.	——	Sunk by bombs by airplanes, Adriatic	9- 9-17
	——	tr.	5,000	Sunk by Italian warships, Dmazzo roads; loaded with munitions	— — —
	——	tr.	3,000	Sunk by Italian warships, Dmazzo roads; loaded with munitions	— — —
162	Elektra	h. s.	——	Torpedoed, Adriatic	18- 3-16
	Beethoven	tr. s.	——	Struck a mine and foundered	17-12-14
172	Thirteen submarines.	——	——	Sunk, Adriatic	- 4-17

TURKISH WARSHIP LOSSES

155	Messudyeh	b.	10,000	Sunk by British sm. B-11, Dardanelles	14-12-14
	Kheyr-Ed-Din	b.	9,900	Torpedoed by British, Sea of Marmora	9- 8-15
181	Midilliox Breslau	a. c.	4,550	Sunk by mine	20- 1-18
158	Mejidieh	c.	3,330	Sunk by Russian mine, Gulf of Odessa	3- 4-15
161	Doruk Reis (type)	g. b.	502	Sunk by Russian d	10-12-15
158	Pelenk-I-Derih	g. b.	886	Sunk in Sea of Marmora, British sm.	24- 5-15
	Marmaris	g. b.	492	Sunk by British in Tigris River	1- 6-15
158, 159	Berk-i-Satvet (type)	g. b.	725	By mine near Dardanelles	29- 4-15
161	Issa Reis (type)	g. b.	500	Scuttled	1-11-14
	Malatia	g. b.	210	Officially reported by Petrograd as sunk in Black Sea	10-12-15
	Yadikar Milet	d.	610	Sunk by British sm.	- 5-15
159, 161	Yar Hissar	d.	284	Sunk by British sm., Sea of Marmora	6- 9-15
	Demir Hissar	t. b.	97	Stranded and interned at Chios	17- 4-15
157	Dhair Hissar	t. b.	97	Driven ashore, Greece	17- 4-15
178	——	t. b.	——	Sunk by gunfire, Black Sea	17
180	——	t. b.	——	Sunk	— — —
	Nagara	tr.	——	Sunk by British sm., Sea of Marmora	- 5-15
158	—— (three)	tr.	——	Sunk by Russian warships; contained troops	— — —
160	Carmen	tr.	4,424	Sm., Marmora	24-10-15
161	Rechid Pasha	tr.	8,000	Sm., Marmora	-12-15
	Bezemialen	tr.	——	Sunk, Black Sea	14-11-14
	Bachriachmar	tr.	——	Sunk, Black Sea	14-11-14
	Midiat Pasha	tr.	——	Sunk by sm.	14-11-14
166	Rodosto	tr.	6,000	Captured by Russian sm.	-10-16

In addition to the above, other Turkish men-of-war may have been destroyed around the Dardanelles and in the Black Sea. Reports from England, Russia and Turkey in regard to these operations are so conflicting that it is impossible to accurately state what Turkish vessels have been destroyed, especially transports and supply ships.

INDEX OF WAR VESSEL LOSSES MENTIONED IN THIS NUMBER

UNITED STATES VESSELS

	PAGE
Ozark (patrol boat)	1659
William Rockefeller (fuel ship)	1659
Wakiva (converted yacht)	1660
President Lincoln (transport)	1664

BRITISH VESSELS

	PAGE
Moldavia (transport)	1678
Ausonia (transport)	1660
Patia (armored merchant vessel)	1681
1 mine sweeper	1677
Cowalip (sloop)	1678
No. 90 (torpedo-boat)	1678
1 destroyer	1678
7 submarines	1687
Leasowe (transport)	1690

FRENCH VESSELS

	PAGE
Diani (submarine)	1693
Prairial (submarine)	1693

RUSSIAN VESSELS

	PAGE
4 submarines	1687
Black Sea Fleet	1692

GERMAN VESSELS

	PAGE
1 submarine	1658
1 submarine cruiser	1659
1 submarine	1660
1 submarine	1661
1 submarine	1661
1 submarine	1662
2 submarines	1676
U C-39 (submarine)	1677
Zeppelin	1679
1 submarine	1679
1 submarine	1679
1 submarine	1679
1 submarine	1681
1 submarine	1685
2 destroyers	1685
1 auxiliary	1685
Y-39 (submarine), entered Spanish port	1688
U-65 (submarine), entered Spanish port	1689
Submarines (general)	1693

AUSTRIAN VESSELS

	PAGE
Szent Istvan (battleship)	1691
1 destroyer	1691

DIPLOMATIC NOTES

FROM MAY 18 TO JUNE 18

PREPARED BY

ALLAN WESTCOTT, PH. D., Instructor, U. S. Naval Academy

GERMANY

FURTHER PROOF OF GERMAN RESPONSIBILITY FOR WAR.—In a series of articles appearing in the *World's Work* and *Land and Water*, Mr. Henry Morgenthau, former American Ambassador to Turkey, supplies conclusive evidence that Germany, in the Potsdam Conference of July 5, reached full decision to precipitate war. The German Ambassador to Turkey, Baron von Waggenheim, was present at the conference and afterward revealed to Mr. Morgenthau what took place. The Kaiser, ambassadors, financiers, military and naval chiefs were present, and after assurances of readiness for hostilities, the bankers were given final warning to liquidate foreign stocks and readjust their finances in the next two weeks before the Serbian *Ultimatum* of July 22. Waggenheim repeated the same story to the Italian Ambassador.

THE EVIDENCE OF MUEHLON'S DIARY.—Published excerpts from the diary of Dr. Wilhelm Muehlon, former Director of Krupp's, confirm the already convincing evidence regarding the Potsdam Conference. Dr. Muehlon resigned from Krupp's not long after war broke out and went to Switzerland, taking up his residence near Berne. His diary, now in press, proves the Kaiser's foreknowledge of the tone and purport, if not the actual phrasing, of the Austrian *Ultimatum*, and gives a day-by-day record of Germany's diplomatic machinations in the first months of the war. It indicates that Germany in August, 1914, sought an understanding with the Pope, used bribery freely to silence the neutral press, and had a full understanding with Turkey.

CONSTANTINE BUSY IN SWITZERLAND.—Since his expulsion from Greece, ex-King Constantine, with his wife Sophie and a train of 54 persons, has taken up his residence in several hotels near Zurich. Here he has set up a kind of court, with pro-German Greek followers, which has become a center of false rumors, espionage, and intrigue. His chief source of financial support is said to be an Austrian banker, Rosenberg. The most fantastic of the schemes of this coterie was the reported proposal, through the United States a few months ago, that the Allies evacuate the Macedonian front on the promise that neither the Bulgarians nor their allies would attack them during the evacuation.

RETURN OF RINTELEN REFUSED BY UNITED STATES.—On June 4 Secretary Lansing sharply refused Germany's offer to exchange an alleged American

citizen named Paul London, held by Germany for espionage in Poland, in return for the release of Captain Lieutenant Franz Rintelen, one-time banker and intimate of the Crown Prince, who is serving a term in a New Jersey prison for conspiring to stir up strikes in the United States. Germany's offer, which was made through the Swiss Ambassador on April 20, threatened severe reprisals on Americans in Germany if Rintelen were not released or exchanged. Secretary Lansing pointed out that Rintelen's offenses occurred before America entered the war, that if he were acting in his capacity as an officer of the German Navy he would be subject to punishment as a spy, and that reprisals would invite reciprocal action on the part of the United States. About 5000 Germans are interned in this country, as compared with about 133 American soldiers and 216 civilians in Germany.

PARTIES SPLIT IN PRUSSIAN FRANCHISE REFORM.—An Amsterdam despatch of June 14 stated that the fourth rejection of the Prussian franchise bill by the Lower House had split both the National Liberal Party and the Catholic Center, to which the Chancellor belongs, into divergent groups. Reactionary elements in both parties blocked the reform; whereas the Prussian Government was pledged to stand or fall on the franchise issue. The next and last reading of the bill occurs July 2.

HOLLAND MENACED BY TEUTONS.—Amsterdam, June 9. (Dispatch to *The London Daily Express.*)—I understand from a trustworthy source that one of the highest German officials connected with the administration of Belgium, speaking to a number of neutral diplomats last week at Brussels, remarked: "We must admit that Zeebrugge and Ostend will temporarily be of little use to the submarine war. Zeebrugge, in fact, is of no use at all and Ostend is very little.

"But there must be no mistake about this. The day that Ostend and Zeebrugge are completely and definitely blocked we shall, cost what it may, make use of the Scheldt as a submarine base. We know that the Scheldt question involves Dutch neutrality, but this would not make us shrink from our decision."—*N. Y. Times,* 10/6.

SWISS TRADE AGREEMENT WITH GERMANY.—Berne, May 18.—The terms of the new treaty between Germany and Switzerland are applicable for nine months, with the proviso that they may be abrogated by either party upon two months' notice. They provide for the monthly export from Germany into Switzerland of 200,000 tons of coal and 19,000 tons of iron and steel. The price of the coal is to be at a minimum 173½ francs for all but 60,000 tons for small consumers, upon which the price will be reduced by 40 francs.

Among the exports which Switzerland agrees to make are cattle to the number of from 15,000 to 17,000 monthly.

The French Government has threatened to withdraw its offer of 85,000 tons of coal monthly to Switzerland if the German-Swiss economic and commercial agreement recently arrived at is ratified by the Swiss delegates.

"We can only maintain the original offer of 85,000 tons monthly provided no compensation whatsoever is given the Germans," says the official note. "If this is not acceptable, the German and Swiss governments can settle the matter between themselves."—*N. Y. Times,* 20/5.

A PROJECTED PEACE OFFENSIVE.—Although, in the midst of the western offensive, the German press and public opinion have swung strongly toward

full acceptance of the militarist program, the semi-official *Kreuz-Zeitung* came out early in June advocating a "peace offensive" and open statement of German aims. The proposal which created a sensation in Germany in view of its possibly official origin, was afterward more or less completely repudiated in the *Kreuz-Zeitung* itself. Vice-Chancellor von Payer, in a statement to the Vienna *Neue Freie Presse* in June, advocated permanent economic and military union between Germany and Austria, the advantages of which would be increased if Russia, Bulgaria, and perhaps Turkey also participated. "Once Germany and Austria are economically and politically united," said the Vice-Chancellor, "who in the world would have the courage to run against this bloc?"

GERMAN POST-WAR PLANS.—In spite of persistent reports of economic exhaustion, Germany continues to plan for the extension of her foreign trade. The European Trading Company, now established at Bremen, is reaching out for the control of imports from Russia, Finland, Persia, and the Far East. The North German Lloyd is one of the principal promoters of this enterprise. Associated with the company are committees, representing a number of leading importing and exporting firms, prominent among them being the concerns which deal in cotton and wool. A similar company, in which Krupps and the Hamburg-American corporation are reported to be heavily interested, has lately been formed at Hamburg. While the terms of participation in some of the undertakings of these companies appear to be regarded, in some quarters, as burdensome, and the companies themselves as monopolistic, the movement itself, backed as it is by the Imperial Government, indicates that German business, in spite of the embarrassments of war, is taking a long look ahead. A correspondent of the London *Times* writes that the Rhenish Iron and Steel combination is reported to have acquired, since 1915, the larger part of the Wolfram mining properties in South America, and is working the mines through an agency in Buenos Aires. Germany's avowed purpose to recover her lost trade in South America lends interest, also, to the announcement that the Nippon Yusen Kaisha (Japan Mail Steamship Company) has at last decided to establish a line to Buenos Aires and Rio Janeiro, by way of Singapore and Cape Town.—*N. Y. Nation*, 8/6.

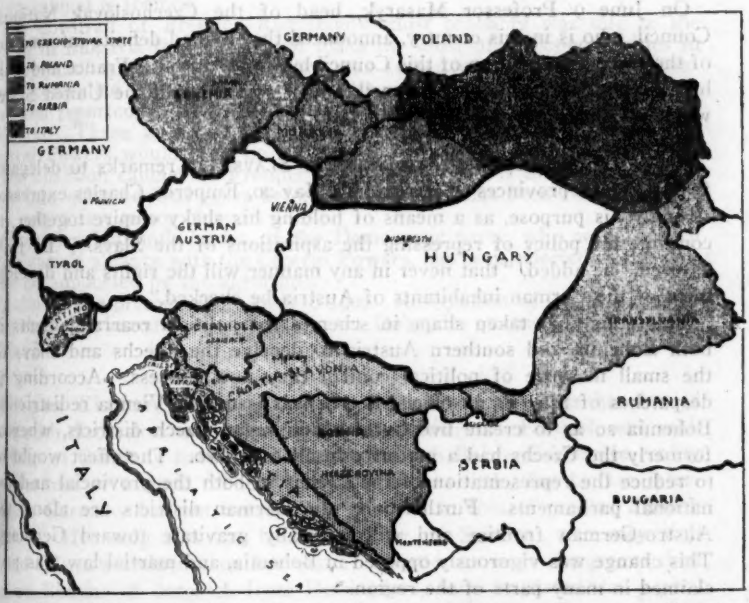
AUSTRIA

ALLIED ENCOURAGEMENT FOR JUGOSLAVS AND CZECHOSLOVAKS.—Since the terms *Jugoslav* and *Czechoslovak* are sometimes confused, it should be borne in mind that while in general the races in both these groups are Slav, they inhabit distinct regions in Austria-Hungary and have distinct though sympathetic national aspirations. Jugoslav is the name taken for the projected union of Serbs, Croats and Slovenes in southern Austria-Hungary; Czechoslovak, for Bohemians, Moravians, Silesians and Slovaks in the north.

The Congress of Oppressed Nationalities at Rome in April, the agreement at that time between Italy and the Jugoslavs as to their respective spheres on the Adriatic, the break-up of Russia, and the weakening of Austria, together with the allied policy in support of self-government for oppressed races, have all served to encourage these nationalistic movements. Troops from both groups have been going over to the Western Allies throughout the war, and distinct divisions of these have been organized in

France, Italy, and Russia to fight the Central Powers. The number of these troops in Russia has been placed as high as 150,000, and parts of them are said to have seized large stretches of the Siberian railway in an attempt to join the forces on the western front. Germany has requested the Soviet Government to disarm these troops and prevent their departure.

At the meeting of the Supreme War Council of the Allies at Paris in the first week of June, a decision was reached which, according to the statement of Premier Lloyd George, "brought the defined policy of the western powers into harmony with the United States on two very important points, namely, concerning Poland and the Czechoslovaks and the



THE MAP SHOWS HOW AUSTRIA-HUNGARY WOULD BE DIVIDED IF SUBJECT RACES FREED THEMSELVES FROM THE GERMAN-MAYGAR YOKE. THE SHADED PORTIONS OF THE TERRITORIES INHABITED BY SUBJECT PEOPLES OF THE DUAL EMPIRE, DIVIDED ACCORDING TO THEIR PROBABLE FATE ON THE BREAK-UP OF THE MONARCHY.—From *N. Y. Tribune*, 6/24.

Jugoslav peoples." Apparently this decision did not extend far beyond sympathy and encouragement; but it indicated a change of policy from that of last winter, when both President Wilson and Mr. Lloyd George, in statements designed to draw Austria away from Germany, denied any purpose to dismember the Hapsburg monarchy.

Secretary Lansing, on May 29, issued the following statement indicating the favorable policy of the United States toward these nationalistic movements:

"The Secretary of State desires to announce that the proceedings of the Congress of Oppressed Races of Austria-Hungary, which was held in

Rome in April, have been followed with great interest by the government of the United States, and that the nationalistic aspirations of the Czechoslovaks and the Jugoslavs for freedom have the earnest sympathy of this government."

SLAVS IN THE UNITED STATES.—While Austrian Slavs in the United States are hostile to Austria, they still suffer from the fact that they are technically "enemy aliens." In a petition to the Senate Foreign Relations Committee on June 5, representatives of these peoples stated that there were from 300,000 to 500,000 men ready to fight in the American Army if their status were changed, and that such action would cause further defections in the Austrian Army.

On June 9 Professor Masaryk, head of the Czechoslovak National Council, who is in this country, announced that he had definite information of the official recognition of this Council by Great Britain. France and Italy had already recognized the Council, and it was thought the United States would soon take similar action.

AUSTRIA'S SCHEMES FOR REPRESSION OF SLAVS.—In remarks to delegates from German provinces of Austria on May 20, Emperor Charles expressed strongly his purpose, as a means of holding his shaky empire together, to continue the policy of repressing the aspirations of the Slavs. "Be fully assured," he added, "that never in any manner will the rights and development of the German inhabitants of Austria be checked."

This policy has taken shape in schemes for political rearrangements in both Bohemia and southern Austria to deprive the Czechs and Slavs of the small measure of political control they now possess. According to despatches of May 22, an official decree was issued in Vienna redistricting Bohemia so as to create five German and seven Czech districts, whereas formerly the Czechs had a majority in all save two. The effect would be to reduce the representation of the Czechs in both the provincial and the national parliaments. Furthermore, the German districts are along the Austro-German frontier and will naturally gravitate toward Germany. This change was vigorously opposed in Bohemia, and martial law was proclaimed in many parts of the region.

At the same time it was announced that Dalmatia would be joined to Croatia, leaving the Slovene districts at the head of the Adriatic, which are essential to German and Austrian control of Trieste, cut off from the rest of the nation and exposed to the stamping out of national feeling by the Germans.

Against both these changes a joint session of Czech and Jugoslav deputies, convened after the dissolution of the Austrian Parliament in May, issued a bitter protest.

COUNT BURIAN'S VISIT TO BERLIN.—No definite announcements were made regarding the results of the visit of Count Burian, Austro-Hungarian Foreign Minister, to Berlin on June 12. Press reports indicated that the purpose of the visit was to secure an Austrian solution of the Polish problem, *i. e.*, the union of Poland under an Austrian prince. No doubt, however, the difficult situation in Austria itself was also considered. The

Italian offensive begun on June 17 was in some measure a means of diverting attention from the serious situation within the Empire, and its success or failure is regarded as likely to decide the fate of the government. Prior to June 18, five Austrian cabinet members, including the Minister for Home Affairs, had tendered their resignations.

BULGARIA

RADOSLAVOFF CABINET RESIGNS.—Sofia, Sunday, June 16, via Amsterdam.—Premier Radoslavoff has tendered the resignation of the cabinet and King Ferdinand has accepted it.

The ministers were requested by the king to retain their portfolios until a new cabinet is formed.

The downfall of Premier Radoslavoff most probably was due to the feeling in Bulgaria that he did not make the most of his opportunities in the negotiations during which peace was forced on Roumania and Roumania compelled to give up the Dobrudja. Many Bulgarians have felt, it has been reported, that the Dobrudja should have been ceded outright to Bulgaria. There also has been some dissatisfaction over whether the Central Powers would back up Bulgaria's territorial claims in Macedonia.

The coalition cabinet of Premier Radoslavoff, who is the liberal leader, came into office several years before the war and has been retained since with only a few minor changes.

Alexander Malinoff, leader of the Democratic party, who was opposed to Bulgaria's alliance with the Central Powers, has been selected as the new premier, supported by the agrarians.

Malinoff was premier from 1906 to 1909. Resignation of the Radoslavoff cabinet, it is believed here, was due to the Dobrudja question.—*Washington Star*, 17/6.

RUSSIA

GERMAN EXPLOITATION OF FINLAND.—The American press has busied itself with discussion as to whether the conservatives in Finland, who with the help of Germany have overcome the Finnish Bolsheviki, are in reality pro-German or neutral. The discussion matters little, for by her intervention Germany has put herself in a position to control present Finnish policies. Her only loss has been the favor of Sweden, who may well regard this new influence on her eastern frontier as more dangerous than that of Russia. A despatch from Helsingfors, June 12, stated that a proposal to make Finland a constitutional monarchy (with a German prince on the throne) was under consideration by the Landtag.

London, June 3.—A secret convention exists between Germany and Finland, which is kept secret from the Finnish Diet, by which the Finnish Government undertakes to establish a monarchy under a German dynasty and to place the Finnish Army under German leadership, according to a despatch to *The Times* from Stockholm quoting the Socialist newspaper *Politiken*, which has sources of information among the Independent Socialists of Germany.

Finland, it is added, agrees also not to cede the Aland Islands to Sweden, and to allow Germany to use the islands for a naval base. Germany further will be permitted to use Finland as a passageway to the Arctic Ocean. Finland agrees to take efficient measures to combat anarchy.

Germany will have the right to maintain a military force in Finland until all the conditions are carried out.

Moscow, May 29. (Associated Press.)—The Germans are building two temporary railways in Northern Finland. One line runs eastward toward

Kem, on the Mourmansk Railway, in Russia, and the other northeastward from a rail-end in Finland toward Petoenga Bay, which is included in the strip of the Mourmansk region which Russia is preparing to cede to Finland. Construction work is easy, as there are many small lakes which can be utilized.

The section of the Mourmansk coast which Russia is preparing to cede is small, stretching from the town of Kirvatunturi north to the Arctic Ocean and east to the rivers Pechenga and Tutovka. The greatest width is about 45 miles. The port on the Arctic which the treaty gives to Finland is about 70 miles from Kola, which is the only ice-free port Russia possesses.

In connection with the proposed cession, M. Vosnesensky, assistant to Foreign Minister Tchitcherin, said to the correspondent:

"The Soviet Government has consented in principle to cede to Finland in exchange for the ports of Ino and Raivola that part of the Mourmansk coast which was ceded to the Bolshevik Finnish Govermnent by our treaty of March 1. Article 15 of that treaty calls for a referendum by the local population on the question of cession, and we shall insist upon that stipulation.

"So far no actual negotiations have taken place, and we do not know the German stand regarding this. The treaty provides that the rights of Russians in the ceded part shall be inviolate, and leaves in force the Russian-Norwegian treaties affecting the Mourmansk coast."

M. Vosnesensky said that the inhabitants of the territory were mostly Finns.—*N. Y. Times*, 4/6.

LITHUANIA ENLARGED.—The White Russian Republic has been proclaimed with Germany's consent, the *Exchange Telegraph* correspondent at Moscow reports, telegraphing under date of May 16. A coalition government has been formed, the despatch states, and negotiations are proceeding regarding the unity of Lithuania and White Russia, with the idea of forming a separate state under a German military protectorate.

White Russia is of indefinite scope, but roughly takes in the region north of the Ukraine, with Poland and the Baltic provinces on the west and Great Russia on the north and east. It includes Lithuania, where the greater part of the population of White Russian nationality resides. Lithuania has already been recognized by Germany as an independent state allied to the German Empire.—*N. Y. Times*, 25/5.

TRANS-CAUCASUS PEACE.—The negotiation of peace between Turkey and the Trans-Caucasus, reported June 13, gives Germany access to a million Mohammedan Tartar troops, of more present value to her than a route to Siberia or India.

Amsterdam, June 13.—A peace treaty has been signed between Turkey and the Trans-Caucasus Government, says a telegram from Constantinople.

Previous to the signing of the Brest-Litovsk treaty between Russia and the Central Powers, which ceded the Provinces of Kars, Batum, and Erivan to Turkey, a separate government had been formed in the Trans-Caucasus region, with a capital at Tiflis. After the Brest-Litovsk treaty Turkey proposed a separate peace to the Caucasian Government, and it was announced that she would recognize an autonomous government in the Caucasus.

Peace negotiations were begun early in May, but simultaneously the Turks began an advance into the territories claimed under the Brest-Litovsk treaty. Batum, Van, and other cities were occupied and thousands of Armenians were massacred. Peace negotiations were then broken off for several days, owing to the Caucasus Government's refusal to permit Turkish troops passage to Persia and to cede the city of Novo-Rossysk, on the Black Sea coast. Apparently the differences were settled and the negotiations carried to completion.—*N. Y. Times*, 14/6.

RUSSIAN CADET PARTY APPEALS TO ALLIES.—Among the remains of parties in Russia, the most firmly favorable to the Western Powers is the Constitutional Democratic or Cadet party. To this group belongs Mr. Boris Bakhmetieff, who was sent by the Kerensky Government as ambassador to the United States, and who on June 11 issued an appeal for American and Allied intervention. The State Department offered no comment in making this appeal public.

THE NEAR EAST

ASIA MINOR AND THE SUEZ.—In the *N. Y. Nation* of June 9, Mr. J. H. Breasted presents the following strong argument for British control of Palestine and ports of Asia Minor as essential to the safety of the Suez Canal.

As long as the leading naval power of modern times has its home in the Atlantic, with great responsibilities in the Pacific, Asia Minor, overlooking as it does the line of communication between those two oceans, must inevitably remain a position of commanding and decisive importance. A hostile power in Asia Minor always threatens Suez; without Suez England cannot command the Pacific, and without English supremacy in the Pacific our own standing there is at once jeopardized. The sinister actions of a German admiral in Manila Bay could be sternly and decisively met by Admiral Dewey because the Suez Canal was open to the English fleet, and the Suez Canal will always be vulnerable as long as there is an efficient and aggressive modern power intrenched in Asia Minor. The Bagdad railway is but one form of the Asia Minor problem, and to any one familiar with the history of the Near East it is simply a catchword which suggests all the fundamental problems of the world war; for in one connection or another it involves them all. To discuss the Bagdad railway, therefore, is to penetrate at once into fundamental questions of the inter-oceanic, intercontinental strategic of this world struggle—a strategic demanding an outlook so spacious that it is bounded only by the planet itself.

The vastness of this outlook, suggested in the above paragraph is completely veiled from the war spectator who gathers his impressions from brief dispatches recording slight advances of the British in Palestine or Mesopotamia—operations which seem to be so strictly local in their significance. A brief examination of the strategic geography of the Near East, however, quickly reveals the far-reaching importance of these operations. Suez, so vital to the power of our great ally in the Pacific, is never safe for a moment if guarded by Egypt alone. The isthmus must be protected on the Asiatic side also, by a buffer of friendly or vassal states, precisely as we have protected the Panama Canal by a neutral zone on both sides. It must always be said to the honor of English statesmen that they did not take adavantage of Turkey's embarrassment in her recent disastrous wars to encroach seriously on the Asiatic side of Suez, as they might easily have done. Would that they had observed the same high-minded policy in Persia!

The strategic significance of the Near East (or of the Ottoman Empire), then, lies in the fact that the shortest route, the main highway between the Atlantic and the Pacific, lies across it, and that such a highway is very vulnerable and must be broad enough to be strategically defensible. By the very existence of her empire, Great Britain is inevitably forced to hold more than the mere Isthmus of Suez; and Egypt is not enough.—*N. Y. Nation*, 9/6.

LATIN AMERICA

MEXICO SUSPENDS RELATIONS WITH CUBA.—It was announced in Mexico City, on May 24, that Mexico had decided to recall her Minister to Cuba and "suspend for an indefinite time the sending of a new minister." Foreign Secretary Aguilar explained on the following day that Mexico had protested in vain at injuries to Mexican citizens due to Cuban war measures, and removed the minister to make things easier "for a friendly republic in an afflicted situation."

This peculiar action was mystifying. However, Cuba announced, on May 27, that "diplomatic relations with Mexico had not been ruptured," and that the Cuban Chargé d'Affaires would remain in Mexico City.

PRESIDENT WILSON TO MEXICAN JOURNALISTS.—In a speech, on June 7, to Mexican journalists visiting the United States, President Wilson emphasized the friendly attitude of this country and our unwillingness to interfere in Mexican affairs. He stated that the Pershing expedition had had for its sole purpose to help Mexico rid itself of Villa.

After referring to false rumors in Mexico, as that 13 U. S. battleships had been sunk off our coast and the loss concealed, the President dwelt upon the increasing world influence of the United States owing to the faith of other nations, especially small nations, in our disinterested aims. The President added that some of us now "look back with regret upon some of the more ancient relations that we have had with Mexico," and "would now feel ashamed to take advantage of a neighbor." He then referred as follows to our pan-American policy:

"Some time ago, as you probably all know, I proposed a sort of pan-American agreement. I had perceived that one of the difficulties of our relationship with Latin America was this: The famous Monroe doctrine was adopted without your consent, without the consent of any of the Central or South American States. If I may express it in the terms that we so often use in this country, we said, 'We are going to be your big brother, whether you want us to be or not.' We did not ask whether it was agreeable to you that we should be your big brother. We said we were going to be.

"Now, that was all very well so far as protecting you from aggression from the other side of the water was concerned, but there was nothing in it that protected you from aggression from us, and I have repeatedly seen the uneasy feeling on the part of representatives of the states of Central and South America that our self-appointed protection might be for our own benefit and our own interests and not for the interest of our neighbors.

"So, I said, 'very well, let us make an agreement by which we will give bond. Let us have a common guarantee, that all of us will sign, of political independence and territorial integrity. Let us agree that if any one of us, the United States included, violates the political independence or the territorial integrity of any of the others, all the others will jump on her.' I pointed out to some of the gentlemen who were less inclined to enter into this agreement than others that that was in effect giving bonds on the part of the United States that we would enter into an arrangement by which you would be protected from us.

"Now, that is the kind of agreement that will have to be the foundation of the future life of the nations of the world, gentlemen. The whole family of nations will have to guarantee to each nation that no nation shall violate its political independence or its territorial integrity.

"That is the basis, the only conceivable basis, for the future peace of the world, and I must admit that I was ambitious to have the states of the two continents of America show the way to the rest of the world as to how to make a basis of peace. Peace can come only by trust. As long as there is suspicion, there is going to be misunderstanding, and as long as there is misunderstanding there is going to be trouble. If you can get a situation of trust, then you have got a situation of permanent peace.

"Therefore, every one of us, it seems to me, owes it as a patriotic duty to his own country to plant the seeds of trust and of confidence instead of the seeds of suspicion and variety of interest. That is the reason that I began by saying to you that I have not had the pleasure of meeting a group of men who were more welcome than you are, because you are our near neighbors. Suspicion on your part or misunderstanding on your part distresses us more than we would be distressed by similar feeling on the part of those less near by.

"When you reflect how wonderful a storehouse of treasure Mexico is, you can see how her future must depend upon peace and honor, so that nobody shall exploit her. It must depend upon every nation that has any relations with her, and the citizens of any nation that have relations with her, keeping within the bounds of honor and fair dealing and justice, because so soon as you can admit your own capital and the capital of the world to the free use of the resources of Mexico, it will be one of the most wonderfully rich and prosperous countries in the world.

"And when you have the foundations of established order, and the world has come to its senses again, we shall, I hope, have the very best connections that will assure us all a permanent cordiality and friendship."—*Washington Post*, 12/6.

COSTA RICA DECLARES WAR.—San Juan del Sur, Nicaragua, May 24.—The government of Costa Rica has declared war on the Central Powers according to advices received here.

This brings the number of nations aligned against Germany up to a total of 21. All of the Central American States have now clearly defined their attitude toward the war. Panama, Nicaragua, and Guatemala have become belligerents. Honduras has severed diplomatic relations with Germany, while San Salvador has remained neutral, explaining that this neutrality is friendly to the United States. The government of Costa Rica, headed by President Tinoco, has never been recognized by the United States. It came into power after the deposition of President Gonzalez in January, 1917.—*N. Y. Times*, 25/5.

PERU SEIZES GERMAN SHIPS.—Lima, Peru, June 14.—The Peruvian Government, through its military forces, has taken possession of the German vessels interned at Callao.

There are eight German vessels interned at Callao, with a capacity of slightly less than 50,000 deadweight tons. They include several large steamers, with passenger accommodations, formerly plying between San Francisco and South American ports and German ports.

When Peru broke off relations with Germany last October, the Peruvian Congress gave authority to the President to utilize the German ships, if the national necessity demanded it.—*N. Y. Times*, 15/6.

MISCELLANEOUS

ALLIED PACT WITH SWEDEN.—London, June 17.—Negotiations are now completed and an agreement between the Allies and Sweden has been signed and ratified by the Swedish Government. The Allies secure the services of Swedish shipping to the extent of 400,000 tons deadweight.

The agreement also provides for granting credits to the Allies in Sweden and regulates the export of Swedish iron ore as between the belligerent groups. The import of Swedish paper pulp also has been arranged.

The Allies on their part undertake to facilitate the importation into Sweden of stipulated quantities of foodstuffs and commodities required by Sweden's trade and industries.—*Washington Post*, 18/6.

ON SAFEGUARDING THE SEAS.—In the June *Review of Reviews* Mr. Harrington Emerson proposes an International Marine Union, with an international marine assembly of delegates from all nations, international registry, flag, safety regulations, war regulations, etc. Commenting on this scheme, Mr. Taft remarks that it shows "imagination," but that it might best grow out of a "more general agreement and league."

Mr. David Jayne Hill writes: "I have never held strongly to the idea of *neutralizing* the seas, which surrenders the world's highways as legal fighting ground. I have held rather to the idea of *internationalizing* the world's highways; that is, to make an attempt at least to keep them safe for everybody. This can be done effectually, however, only by the co-operation of the great maritime powers."

Mr. George W. Wickersham comments thus: "I do not think there is any subject on which there is so much loose thinking as 'freedom of the seas.' Personally, I consider the idea that in time of war any great maritime nation should agree that the ocean should be free to her enemies and to neutral ships to carry supplies to her enemies is preposterous. It would be destructive of the possibility of America defending herself in a great war. It would allow Germany to strengthen herself beyond the possibility of the rest of the world thwarting her ambition."

"The real difficulty," says Dr. Nicholas Murray Butler, "is that it [such a union] is more or less directed against the naval power of England, which has in itself been a great bulwark of advancing civilization. It has long been my belief that the burden which Great Britain has so long borne might well be borne by an organized society of free peoples; but to bring this about will involve many difficult negotiations, including particularly such as bear on the internationalization of canals, straits, and waterways."

Mr. P. W. Wilson, formerly a Liberal Member of Parliament, affirms that Britain is ready to "share her trusteeship" of the seas.

ONE-MAN CONTROL IN WAR.—After America had had more than a hundred years' experience of a one-man executive, President Wilson, who at the time was a university professor, wrote in his book "The State," in which he critically reviewed the forms of government of the principal ancient and modern countries:

"Under our own system the heads of departments are, of course, brought together into at least nominal unity by their common subordination to the President. Although they are, as we have seen, rather the colleagues than the servants of the President, his authority is yet always in the last resort final and decisive; the secretaries have had very few powers conferred upon them by Congress in the exercise of which they are more or less subject to presidential oversight and control. The President is in a very real sense head of the Executive. . . . . Perhaps it is safe to say that only in Germany among the constitutional states, have we an example of a supreme guiding will in administration. The Emperor's own will, or that of the Vice-regent Chancellor, is the real center and source of all policy; the heads of departments are ministers of that will. And there is, of course, under such a system an energy and coherence of administrative action such as no other system can secure."

While a one-man executive will provide "an energy and coherence of administrative action such as no other system can secure," the British system of Cabinet government, which has been copied by the European democracies, provides vacillation, incoherence, muddle, and endless delays. That has been abundantly proved by the present war.

Warfare, like navigation, is essentially a one-man business. No one would dream of entrusting the handling of a ship to an inexpert committee of jointly responsible members. Yet the many-headed Cabinet, being the national executive, has hitherto conducted the war, not only in England, but in France, and other democratic countries as well. Now, in warfare, the unity of direction is as essential as it is in navigation. Moreover, the conduct of war should be not in the hands of civilians, but of experts. Napoleon, the greatest general of modern times, wrote:

"L'Unité de commandement est de la première nécessité à la guerre. . . .

"A force de disserter, de faire de l'esprit, de tenir des conseils, il arrivait aux armées françaises de ce temps (1795) ce qui est arrivé dans tous les siècles en suivant une pareille marche; c'est de finir par prendre le plus mauvais parti, qui, presque toujours à la guerre, est le plus pusillanime, ou, si l'on veut, le plus prudent. La vraie sagesse, pour un général, est dans une détermination énergique. . . . .

"A la guerre, les hommes ne sont rien, c'est un homme qui est tout.

"La tête, c'est le tout d'une armée: ce n'est pas l'armée romaine qui a soumis la Gaule, mais César; ce n'est pas l'armée carthaginoise qui faisait trembler la République aux portes de Rome, mais Annibal; ce n'est pas l'armée macédonienne qui a été sur l'Indus, mais Alexandre; ce n'est pas l'armée française qui a porté la guerre sur le Weser et sur l'Inn, mais Turenne; ce n'est pas l'armée prussienne qui a défendu sept ans la Prusse contre les trois plus grandes puissances de l'Europe, mais Frédéric-le-Grand."

"Un mauvais général vaut mieux que deux bons."

President Lincoln, quoting and amplifying Napoleon's opinion, stated on the 3d of December, 1861:

"It has been said that one bad general is better than two good ones, and the saying is true if taken to mean no more than that an army is better directed by a single mind, though inferior, than by two superior ones at variance and cross-purposes with each other.

"And the same is true in all joint operations wherein those engaged can have none but a common end in view and can differ only as to the choice of means. In a storm at sea no one on board can wish the ship to sink, and yet not infrequently all go down together because too many will direct and no single mind can be allowed to control."

The greatest admirals and generals of all times have frequently called officers together in order to hear their opinions and to discuss important matters, but all great generals and admirals who have written on warfare have, without exception, condemned conduct of war by a council, even if it should be composed of the most eminent soldiers and sailors. Many views similar to those of Napoleon and Lincoln might easily be given. If all great soldiers and sailors have condemned warfare by a committee of experts, how much more strongly then would they condemn warfare by a committee of political amateurs whose attention is divided between executive, administrative, legislative, and party-political functions, and who are responsible not only for their own department but for the conduct of all the other departments of state as well! It seems quite obvious that the faulty organization of modern democracy, Cabinet government, as evolved in England and copied by the other European democracies, has been responsible for most of the disappointments which England and her allies have experienced in the present war.—"POLITICUS," *Fortnightly Review*, May.

REVIEW OF BOOKS

ON

SUBJECTS OF PROFESSIONAL INTEREST

"Front Lines." By Boyd Cable. Net $1.50. (E. P. Dutton and Co., New York, N. Y.)

As stated by the author in his "Foreword" to this book, there are altogether too many cases of individuals scattered over the country who either do not yet realize the conditions of life as undergone by those who are really winning this war for us, or what is infinitely more shameful but true, are unwilling to forego a part of their accustomed pleasures or profits in order that necessary supplies of all kinds may speedily and surely be provided for the prosecution of the struggle into which the civilized world has been thrown, and from which we must fight our way to victory, with *all* the resources at our disposal.

If some method could be devised whereby *each* of the hundred odd millions of Americans could be made to understand that this is *his own fight,* and the man in the trench is there doing the actual fighting for him, and in doing so is facing death or a life of physical suffering, then our part would become a visible and overpowering factor, which would end the war in the quickest time, and the number of our men whose lives are snuffed out by the enemy would be reduced to the minimum.

There are those all over the country who, while engaged in work that is contributing to the prosecution of the war, and thus claiming exemption from the draft law, look on such employment not as a means to the ending of the war, but merely as a haven of refuge from the dangers of facing the Hun in combat.

The stories in "Front Lines" are told in simple form, showing graphically the conditions of life at the front, and the disgruntled workers and idlers at home, by reading these happenings, may be brought to know that *any lack* of co-operation on their part will prolong and increase the physical hardships and sufferings of their fighters, to say nothing of lives lost needlessly.

It is to be feared that, like all undesirables, the "slacker," physical, mental and moral, will be always with us; but if his number can be reduced by education, then will the war for freedom be shortened, and it is hoped that books of this sort will prove to be one effective method of conducting this education.

A. D. R.

"Japan—The Rise of a Modern Power." By Robert P. Porter. With maps and five illustrations. $2.25. (Oxford University Press.)

The object of this book is to bring English-speaking peoples closer in knowledge and sympathy to the Japanese. The author, who died before the book was completed, was an Englishman who had enjoyed a long and dis-

tinguished career as a journalist and publicist in the United States. He was also an extensive traveler, and his contact with Japan seems to have inspired him with the belief that Englishmen and Americans knew far too little about the Japanese people. In fact, this is his second work on that theme.

The book is divided in two parts: The first tells the history of Japan from 660 B. C. to the surrender of Kiao-Chau in 1914; the second treats of the characteristics of present-day Japanese civilization. In the historical survey the author had the wisdom to pass lightly over the centuries of factional quarrels, relieved only rarely by a great figure, like Kublai Khan or Hideyoshi, and give space to the last 40 years, which made Japan one of the world powers. The style is journalistic, and the book as a whole is well adapted to the newspaper type of reader who would like to know something about Japan, past and present, at a cost of only two or three hours' time. The book would be more valuable if the author had cared less for statistical facts and given more thought to interpreting them, particularly to interpreting for the Anglo-Saxon the Japanese mind. The most vital thing in bringing about a genuine entente between the westerner and the oriental is to give the former a respectful understanding of the latter's point of view, particularly in regard to those things in which they differ radically. W. O. S.

"The War and the Bagdad Railway." By Morris Jastrow, Jr., Professor in the University of Pennsylvania. 160 pages with map and illustrations. Price $1.50. (J. B. Lippincott Co., Philadelphia.)

This short book is divided into two main chapters: The Story of Asia Minor, and the Story of the Bagdad Railway. In the first chapter Professor Jastrow develops the interesting thesis that the "key to the eastern situation" lies in control of the historic, age-old highway from Constantinople to Bagdad, through the Cilician Gates now pierced by tunnel; and that a secure grip on both poles or termini is essential to mastery of the Near East. From the *Hinterland* of Asia Minor, Hittites, Cimmerians, Greeks under Alexander, Romans, Crusaders, Turks, and Mongols have all threatened and at times dominated the fertile valleys of the Euphrates and the Nile. The empires built up by these races, as well as by Babylonia, Assyria, and Persia, have all depended on their firm hold of Asia Minor and the route from the Bosporus to the Persian Gulf.

The Bagdad Railway was the weapon of Germany to dominate the East. In the opinion of Professor Jastrow, it was "the most significant single factor" contributing to the outbreak of the war, and will be one of the most momentous problems at its close. Since the route from Berlin to Bagdad ran through Serbia, there was an obvious significance in Germany's contention that there should be no interference in the quarrel between Serbia and Germany's ally. Professor Jastrow describes the construction of the earlier roads from Constantinople to Angora and Konia, and the tremendous concession of March, 1903, from Konia through Bagdad to Basra, a distance of 1415 miles, making a total, with branch lines, of 2375 miles of railway under German control. Had the road been international-

ized, had it been a purely commercial venture, had it not been made an instrument for German political domination, it would have been of inestimable benefit to the world. At this point the author is unduly credulous of Germany's apparent offers to give France and England a share in the management of the route. French and British capital was indeed needed; but the road was to be built by German engineers, the materials were to be purchased in Germany, and the road itself was to remain firmly in German hands.

Russia, France, and Great Britain, aroused by this threat, merged their interests; and Great Britain, by her hold on the Persian Gulf and rivers, was able to put a stopper on the eastern exit to the sea. Hence the negotiations which led to the Anglo-German agreement at last ready for signature in July of 1914. This agreement, as shown by the recent revelations of the German Ambassador to England, Prince Lichnowsky, extended the German sphere of interest clear to Basra, with navigation of the Shatt el Arab below in the hands of an international commission. It showed how much Britain was willing to concede as the price of peace, and how far she was from standing in the way of Germany's colonial ambitions. But with the leaders controlling Germany, it was now all or nothing—domination or downfall; disregarding the creditable accomplishment of their London ambassador, they threw aside diplomacy for war.

Excellent as Professor Jastrow's book is, it could have been improved. We have had at least a thousand such discussions as he gives of the European situation and the background of the war, by men as well or better informed. We would gladly have seen this cut down for the sake of a more vivid and intimate picture of the cities along the Bagdad route, its commercial possibilities, the reclamation of the Euphrates valley, the navigation of Mesopotamian rivers, the races and civilization of the region. In short, by keeping more closely to the subject of which he has expert personal knowledge, he could have made a better book. A. W.

"Air Craft and Submarines." By Mr. Willis J. Abbott. Price $3.50. (G. P. Putnam's Sons.)

In this book the author has sketched swiftly the slow stages by which in each of these fields of activity success has been attained. He has collated from the immense mass of records of the activities of both submarines and air craft enough interesting data to show the degree of perfection and practicability to which both have been brought. And he has outlined so far as possible from existing conditions the possibilities of future usefulness of these new devices in fields other than those of war.

This book is written for the layman and will be of no technical value to the naval service at large.

The author fixes the beginning of practical aeronautics with the invention of the hot air balloon in 1783 by the Montgolfier Bros., paper makers of Paris, who, after considerable experimenting with small paper bags, built a bag of paper reinforced with linen 35 feet in diameter which they filled with hot gases and released. To the astonishment of a great multitude, this bag rose to a height of 6000 feet before descending. Following the initial

success, the demand at once arose for an ascension by a human being. A gas bag 74 feet high and 48 feet in diameter was built by a professor of physical science, Pilatre de Rozier, who was joined by the Marquis d'Arlandes. "The car was well filled with bundles of fuel to fill the iron brazer" to provide the necessary heat to remain aloft. The ascent was a great success, the intrepid aviators sailing over Paris on this flight.

Ballooning became a popular fad, but it remained for Henry Gifford, a Frenchman, to practically demonstrate in 1852 the use of mechanical propulsion, when he designed a cigar-shaped balloon 150 feet in length, propelled by a three horse-power steam engine, with which he was able to attain a speed of from five to seven miles an hour. No further progress was made in aeronautics until 1898, when Santos-Dumont entered the field with his non-rigid type of dirigible balloon, and for the first time used the internal combustion engine as a propelling agency.

About this time Count Zeppelin, then a major general of cavalry in the German Army, was dismissed for studying aeronautics to the exclusion of his military duties. Relieved of his command, Count Zeppelin, at his own expense, built a plant at Lake Constance and developed the now famous rigid type of dirigible bearing his name. Count Zeppelin shared the varying fortunes of the inventor in which most of his fortune was used up until 1902, when the Kaiser was attracted by the military possibilities of the dirigible, and the inventor was furnished the necessary funds to build a great air ship. This was the first of the large fleet of Zeppelins which was later to be used in air raids on London and the coast towns.

In the early part of the nineteenth century, Sir George Cayley, Henson, Stringfellow and Wenham developed types on the theory that "a series of planes representing a fixed angle to the breeze and driven against it by a sufficiently powerful motor would develop a considerable lifting power." This was the beginning of the aeroplane.

In 1890 Sir Hiram Maxim built a very large plane. Two German brothers, Otto and Gustave Lilienthal, and an Englishman named Pilcher, each built motor-driven aeroplanes, but were killed before their machines were developed. The author states that "it would be unjust to claim for the Wrights entire priority in the field of the glider and heavier than air machine. Professor Langley preceded them with an aeroplane, which, dismissed with ridicule as a failure in his day, was long after his death equipped with a lighter motor and flown by Glen Curtis, who declared that the scientist had solved the problem had only the explosive engine been perfected in his time."

The Wrights made their first flight of 12 seconds and another one of 59 seconds near their home in Dayton, Ohio, in December, 1903. Due to lack of interest in this country, they were forced to go to France in 1908 where they were received with enthusiasm. In 1909 they received their first contract for an aeroplane from the United States Government. This was to cost $25,000. The test was successful and their future was assured in this country. It is interesting to note that the total time in the air for both the Wrights from 1900 to 1908 was only about four hours.

At the opening of the war Germany possessed about 1000 planes, exclusive of 450 in private hands; of this total number about 700 were ready for immediate service. In addition, she had about 40 dirigibles, of which 14 were Zeppelins.

France possessed about 2000 aeroplanes, of which 500 were in private hands, and about 25 dirigibles. However, 550 of these were immediately discarded by the decision to standardize.

England possessed about 500 aeroplanes, of which number 200 were seaplanes, and 15 dirigibles.

Russia had about 800 planes and 25 dirigibles.

Prior to 1916, this government had given orders for just 59 aeroplanes, scarcely enough to justify the manufacturers to keep their shops open. Orders from foreign governments, however, stimulated production after the war began so that when the United States entered the war, Mr. Howard E. Coffin, Chairman of the Air Craft Section of the Council of National Defense, was able to report eight companies capable of turning out about 14,000 machines in six months.

* * * * * * * * * *

Cornelius Drebel, born in 1572, in the town of Alkamaar, Holland, is credited with building the first submarines during the period 1620-1624. A trial was made in the Thames River of a boat with 12 rowers besides passengers. It is related that the inventor "would by unstopping a vessel full of this liquor, speedily restore to the troubled air such a proportion of vital parts as would make it again for a good while, fit for respiration." The narrative suggests that in some way Drebel had discovered the art of compressing oxygen or possibly the secret of liquid air.

The credit for using a submarine boat for the first time in actual warfare belongs to a Yale graduate named David Bushnell from Saybrook, Conn. Bushnell was the builder of the famous "turtle" used to attack the British ships lying off Governor's Island in New York in revolutionary times. In the words of the operator, Ezra Lee, "When I rode under the stern of the ship (*The Eagle*), I could see the men on deck and hear them talk. I then shut down all the doors and sunk down and came up under the bottom of the ship." He had hermetically sealed himself inside of a craft, shaped like two upper turtle shells joined together. He had entered through the orifice at the top, whence the head of the turtle usually protrudes. This before sinking he had covered and made water-tight by screwing down upon it a brass crown or top like that of a flask. Within he had enough air to support himself for 30 minutes. The vessel stood upright, not flat as the turtle carries himself. It was maintained in this position by lead ballast. Within, the operator occupied an upright position, half sitting, half standing. To sink, water was admitted which gathered in the lower part of the boat; while to rise again, this was expelled by a force pump. There were ventilators and port holes for the admission of light and air when operating on the surface, but once the cap was screwed down, the operator was in darkness. In this craft, Lee drifted alongside of the ship, navigating with difficulty with his single oar. He went under the ship and attempted to fix the wooden screw of the bomb into her bottom, but struck, as he supposes a bar of iron. Not being well skilled in the

management of his boat, in attempting to move to another place, he lost the ship.

In 1800, Robert Fulton built the *Nautilus* for the French Government with which he was able to blow up an old French frigate. He also built the *Mute*, 80 feet long, 21 feet wide and 14 feet deep, propelled by an engine, but died before the trials were completed. In 1855-56 Bauer, a German, built a submersible for the Russian Government 52 feet long. Submersion and stability were regulated by four cylinders into which water could be pumped at will. It is said that 134 successful trips were made in this boat. There was considerable submarine activity during the Civil War, but none of the projects turned out successfully. About 1870 Mr. Whitehead, an English engineer, in collaboration with an Austrian army officer, developed the Whitehead torpedo which exerted a powerful influence in stimulating submarine movements. During this period Mr. John P. Holland, without aid from his government, built eight boats in the development of his ideas. It was not until *Holland No. 9* was built in 1900 that the United States Government would interest itself to the point of purchasing one of these boats. On April 11, 1900, *Holland No. 9* was purchased for $150,000, which was $86,000 less than the cost price to the builders. The following August six more of these boats were authorized—the beginning of our submarine navy. During this time Mr. Simon Lake was active in submarine matters, but it was not until 1911 that the United States Government gave a Lake boat a trial. Following this, several of these boats were built.

Specific information with regard to submarine construction since the beginning of the war in 1914 is jealously guarded by the navies; however, at the beginning of 1916, the United States had a total of 105 submarines, built or authorized with a displacement of 59,405 tons. At the beginning of the war the British had 82 active submarines of five different classes with 22 under construction; the French had 92 submarines in active service.

Of the great naval powers, Germany was, strangely enough, the last to become interested in the building of submarines. Not until submarines built in the United States, England and France had been proved practical, did the Germans seriously concern themselves with the creation of a German submarine fleet. They rapidly developed the 236-ton boat built in 1905. The author reports a 5000-ton boat 414 feet in length with a radius of 18,000 to 20,000 miles. This submersible cruiser mounts six to eight guns, 30 torpedo-tubes, and carries 90 torpedoes.

"Air Craft and Submarines, twin terrors of the world's greatest war! The development, though by no means the final development of dreams that men of many nations have dreamed throughout the centuries! They are two of the outstanding features of the war; two of its legacies to mankind. How much these legacies may be worth in peaceful times is yet to be determined."

"The Navy as a Fighting Machine." By Rear Admiral Bradley A. Fiske, U. S. Navy. Second edition. (Charles Scribner's Sons, 1918.)

The contents of the first edition of Admiral Fiske's book—with a few revisions the same as the present volume—are or should be too familiar

to require a summary. It was and still is a much needed bridge between naval thought and civilian thought. The author's insistence upon thoroughgoing examination and analysis of our naval problems, his plea for a logical "estimate of the situation," for a definite naval policy, for a scientifically organized and developed naval strategy, and his clear warning that there is an intimate connection between policy and strategy, reinforced by illustrative comment and statistics, "carried on" the lifework of Mahan. For if there be any successor to the American philosopher of sea power, it is Admiral Fiske. If there be any book, in addition to Mahan's works, or, because brief and up to date, more accessible and more practical to the layman, which should be considered a manual of naval thought concerning the Great War, it is "The Navy as a Fighting Machine." It is a text-book for the American citizen who votes for his next representative in the Congress of the United States; it is a text-book for representatives and senators; and it is particularly a text-book for the members of the Senate and House Committees on Naval Affairs.

The first edition was published in October, 1916. As the old saying goes, "A great deal of water has gone under the bridge" since then. The United States Navy is, to say the least, on a very different basis of matériel, personnel, and action. To what extent have our naval problems been solved by more thoroughgoing analysis? To what extent has a sterner "estimate of the situation" brought about clearer vision? Does the United States now have a "definite naval policy"? Is there a greater consciousness of the "intimate connection between policy and strategy"? It is no criticism of any one man or set of men to say that whereas two years, including a year of war, have brought about much progress in these vital matters; nevertheless, the problems thus stated are still immediate, and have not yet been altogether solved. Why? Partly because the time has been too short to render complete solutions humanly possible. The shortcomings of the United States Navy, covering a period of 10 years and more, can be traced to those who own that navy—the American people. The critics of the navy who are not convinced of this truth should read Admiral Fiske's book. They will see then more clearly how tremendous has been the task confronting the naval administration, and the more they learn of the giant strides in preparedness made *since appropriations in sufficient amounts* were forthcoming, the more they will marvel at the unprecedented, and as hitherto considered, the superhuman accomplishments, of the navy. For even when the known facts, significant as they are, have been stated, the story has not yet been begun.

The shortness of time, however, is by no means the only factor which still prevents full solution of "a definite naval policy," and a full understanding of what is meant by an "estimate of the stituation." Reduced to the simplest terms, and given its true bearing of responsibility, the answer can be stated as follows: The *American people,* even now, fail to realize that the United States Navy has not had to face the German Navy single-handed, that therefore our naval preparedness has not in any ultimate sense been put to the test. Once again, as so often in the past, it has been our rare good fortune to avoid and escape a decisive death-struggle. To take the highest

ground, the United States Navy may even have saved the British Navy. But what could the United States Navy have done, living up to its proudest traditions, doubtless, pitted single-handed against a foe which ranked second as a naval power, while we admittedly ranked fourth? At the present writing the United States has added a proud wing, but only a wing, to the British Grand Fleet. We may decide the issue of the war on the sea, but we shall not do this alone. For, as Admiral Fiske writes, "War strategy is merely the child of preparation strategy." Consider the result of 10 years of intensive "preparation strategy" by the British Navy. Early in August, 1914, the final order to the British Navy consisted of but one word: "Go." Is further comment necessary for American citizens?

So much for the reverse side of the shield. What of the front presented to Germany? Trace the curve of tonnage sunk by German submarines, and note the effect of American destroyer activity. Ponder the convoy system. Ask how many troop transports have been sunk "coming back." How many "going over"? What proportion of the essential foodstuffs of our Allies are we sending over 3000 miles? What is the answer? Appropriations? Increase in matériel and personnel?

Perhaps the true answer, underlying all else, is to be found in two sentences from the pen of Admiral Fiske. On page 131, in both editions, there occurs this sentence: "But operations have suffered incomparably more than matériel and personnel; because naturally *the people* do not comprehend the supreme importance of being ready, when war breaks out, to operate the matériel and personnel skillfully—in accordance with well-prepared plans. Therefore, *they fail to provide the necessary administrative machinery.*" At the bottom of the page, referring to the foregoing sentence, is the following footnote: "Since this was written, the Congress has so enlarged the scope of the Office of Chief of Naval Operations as to make it *a General Staff.*"

This sentence and this footnote, to the discerning reader, are the most significant in the whole volume. They are provocative of no little thought, and they should rightly lead to a congratulatory conclusion. To paraphrase a famous line of Hamlet's, "They certainly should not make the judicious grieve."

H. C. W.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-fifth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control. To be declared elected, they must receive the affirmative vote of three-quarters of the members represented at regular or stated meetings, either in person or by proxy.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control. The Board of Control will at each regular meeting ballot on the nominations submitted for election, and nominees receiving a majority of the votes of the board membership shall be considered elected to membership in the United States Naval Institute."

Sec. 8. The annual dues for regular and associate members shall be two dollars and fifty cents, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be forty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly; subscription for non-members, $3.00; enlisted men, U. S. Navy, $2.50. Single copies, by purchase, 30 cents; issues preceding January, 1918, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ESSAY, 1919

A prize of two hundred dollars, with a gold medal, and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best essay on any subject pertaining to the naval profession published in the PROCEEDINGS during the current year. The prize will be in addition to the author's compensation paid upon publication of the essay.

On the opposite page are given suggested topics. Essays are not limited to these topics and no additional weight will be given an essay in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. All essays published in the PROCEEDINGS during 1918, which are deemed by the Board of Control to be of sufficient merit, will be passed upon by the Board during the month of January, 1919, and the award for the prize will be made by the Board of Control, voting by ballot.

2. No essay received after November 1 will be available for publication in 1918. Essays received subsequent to November 1, if accepted, will be published as soon as practicable thereafter.

3. If, in the opinion of the Board of Control, the best essay published during 1918 is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention," or such other distinction as the Board may decide.

4. In case one or more essays receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

5. Essays are limited to fifty (50) printed pages in the PROCEEDINGS of the Institute.

6. It is requested that all essays be submitted typewritten and in duplicate; essays submitted written in longhand and in single copy will, however, receive equal consideration.

7. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

G. M. RAVENSCROFT,
Lieut. Commander, U. S. N., Secretary and Treasurer.

TOPICS FOR ESSAYS

SUGGESTED BY REQUEST OF THE BOARD OF CONTROL

"Duties and Responsibilities of Subordinates with Special Reference to the Relations between Commanders-in-Chief and Chief of Naval Operations; Commanders-in-Chief and Force Commanders; Force Commanders and Division Commanders."

"Initiative of the Subordinate—Its True Meaning."

"Military Efficiency Dependent upon National Discipline."

"Governmental Organization for War."

"Naval Gunnery, Now and of the Future."

"Naval Policies."

"The Place of the Naval Officer in International Affairs."

"Moral Preparedness."

"Tact in Relation to Discipline."

"The Principles of Naval Administration in Support of War-Time Operations."

"What Steps in Organization and Training Should be Taken to Maintain and Increase the Efficiency of the Navy at the Close of the Present War."

"Responsibilities and Duties of Naval and Military Officers of the United States in Educating and Informing the Public on Professional Matters."

"A Commission in The Navy: Its Meaning and the Obligations Which It Involves."

"The Relations of an Officer to his Subordinate, Both Commissioned and Enlisted."

"The True Meaning of the Expression 'An Officer and a Gentleman.'"

"The Effect of the Present War upon Views Previously Held of Naval Strategy, Tactics and Logistics."

"Seen in the Light of Recent Events, What Should Be the United States Navy of the Future as Regards Types and Numbers of Ships."

"Probable Future Development of Surface-craft, Air-craft and Submarines and the Relation of these Types to Each Other and to Naval Warfare in General."

"The Grand Strategy of the Great War, with Especial Reference to Coördination, and Lack of Coördination, Between Naval and Military Forces."

"The Problem of Overseas Operations in the Light of Recent Developments."

"The Influence of Sea Power upon History as Illustrated by the Great War."

LIST OF PRIZE ESSAYS

"WHAT THE NAVY HAS BEEN THINKING ABOUT"

1879

Naval Education. Prize Essay, 1879. By Lieut. Commander A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut. Commander C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881

The Type of (I) Armored Vessel, (II) Cruiser Best Suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882

Our Merchant Marine: The Causes of Its Decline and the Means to Be Taken for Its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut. Commander F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883

How May the Sphere of Usefulness of Naval Officers Be Extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886

What Changes in Organization and Drill Are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887

The Naval Brigade: Its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888

Torpedoes. Prize Essay, 1888. By Lieut. Commander W. W. Reisinger, U. S. N.

1891

The Enlistment, Training and Organization of Crews for Our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892

Torpedo-boats: Their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894

The U. S. S. Vesuvius, with Special Reference to Her Pneumatic Battery. Prize Essay, 1894. By Lieut. Commander Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut. Commander Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention 1896. By Lieutenant John M. Ellicott, U. S. N.

1897

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut. Commander Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903

Gunnery in Our Navy. The Causes of Its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure Its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear Admiral Stephen B. Luce, U. S. N.

1906

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut. Commander A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A Few Thoughts on Our Next Step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut. Commander Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENCE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut. Commander Yates Stirling, U. S. N.

1909

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotton, U. S. N.

1911

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conard, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

1912

Naval Might. Prize Essay, 1912. By Lieutenant Ridgely Hunt, U. S. N. (retired).

INSPECTION DUTY AT THE NAVY YARDS. Honorable Mention, 1912. By Lieut. Commander T. D. Parker, U. S. N.

1913

The Greatest Need of the Atlantic Fleet. Prize Essay, 1913. By Lieut. Commander Harry E. Yarnell, U. S. N.

NAVY DEPARTMENT ORGANIZATION. A Study of Principles. First Honorable Mention, 1913. By Commander Yates Stirling, Jr., U. S. N.

TRAINED INITIATIVE AND UNITY OF ACTION. Second Honorable Mention, 1913. By Lieut. Commander Dudley W. Knox, U. S. N.

1914

The Great Lesson from Nelson for To-day. Prize Essay, 1914. By Lieut. Commander Dudley W. Knox, U. S. N.

NAVAL POLICY AS IT RELATES TO THE SHORE ESTABLISHMENT AND THE MAINTENANCE OF THE FLEET. Honorable Mention, 1914. By Captain John Hood, U. S. N.

OLD PRINCIPLES AND MODERN APPLICATIONS. Honorable Mention, 1914. By Lieut. Commander Dudley W. Knox, U. S. N.

MILITARY PREPAREDNESS. Honorable Mention, 1914. By Naval Constructor Richard D. Gatewood, U. S. N.

1915

The Rôle of Doctrine in Naval Warfare. Prize Essay, 1915. By Lieut. Commander Dudley W. Knox, U. S. N.

AN AIR FLEET: OUR PRESSING NAVAL WANT. First Honorable Mention, 1915. By Lieut. Commander Thomas Drayton Parker, U. S. N.

TACTICS. Second Honorable Mention, 1915. By Ensign H. H. Frost, U. S. N.

DEFENCE AGAINST SURPRISE TORPEDO ATTACK. Third Honorable Mention, 1915. By Ensign R. T. Merrill, 2d, U. S. N.

1916

The Moral Factor in War. Prize Essay, 1916. By Lieutenant (J. G.) H. H. Frost, U. S. N.

NAVAL PERSONNEL. First Honorable Mention, 1916. By Lieut. Commander J. K. Taussig, U. S. N.

EDUCATION AT THE U. S. NAVAL ACADEMY. Second Honorable Mention, 1916. By Lieutenant Ridgely Hunt, U. S. N.

SOME UNDERLYING PRINCIPLES OF MORALE. Third Honorable Mention, 1916. By Commander Dudley W. Knox, U. S. N.

LARGE *vs.* A GREATER NUMBER OF SMALLER BATTLESHIPS. Lippincott Prize Essay. By Lieut. Commander Thomas Lee Johnson, U. S. N.

1917

Commerce Destroying in War. Prize Essay, 1917. By Commander Lyman A. Cotten, U. S. Navy.

THE PEOPLE'S RÔLE IN WAR. First Honorable Mention, 1917. By Lieutenant H. H. Frost, U. S. Navy.

THE NATION'S GREATEST NEED. Second Honorable Mention, 1917. By Colonel Dion Williams, U. S. Marine Corps.

1918

Letters on Naval Tactics. Prize Essay, 1918. By Lieutenant H. H. Frost, U. S. N.

THE PREPAREDNESS OF THE FUTURE. First Honorable mention, 1918. By Commander H. O. Rittenhouse, U. S. N. Retired.

NAVAL STRATEGY. Second Honorable Mention, 1918. By Rear Admiral Bradley A. Fiske, U. S. N.

NOTICE TO MEMBERS

More members, both regular and associate, are much desired. Any increase in membership invariably means

NOTICE TO MEMBERS

More members, both regular and associate, are much desired. Any increase in membership invariably means larger number of papers and essays submitted, and consequently an improvement in the PROCEEDINGS.

You are requested to send or give the attached slip to some one eligible for membership, urging him to join.

By direction of the Board of Control,

G. M. RAVENSCROFT,
Secretary-Treasurer.

CONSTITUTION, Art. VII, Sec. 8.—"The annual dues for regular and associate members shall be two dollars and fifty cents, payable upon joining the Institute and upon the FIRST DAY OF EACH SUCCEEDING JANUARY. The fee for life membership shall be forty dollars." There is no initiation fee.

.....

.....191

To the Secretary and Treasurer,
U. S. Naval Institute,
Annapolis, Md.

Dear Sir:

Please enroll my name as a { *regular* / *associate* } *member of the U. S. Naval Institute from this date.*

Very truly yours,

.....

.....